E 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648-XB627]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Pier 58 Reconstruction and Pier 63 Removal Projects in Seattle, Washington

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; proposed incidental harassment authorizations; request for comments on proposed authorizations and possible Renewals.

SUMMARY: NMFS has received a request from the City of Seattle (City) for authorization to take marine mammals incidental to the Pier 58 Reconstruction Project and Pier 63 Removal Project in Seattle, Washington. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue two incidental harassment authorizations (IHAs) to the City to incidentally take, by Level A and Level B harassment only, marine mammals during the specified activities. NMFS is also requesting comments on possible one-time, one-year renewals of each IHA that could be issued under certain circumstances and if all requirements are met, as described in **Request for Public Comments** at the end of this notice. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorizations and agency responses will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than [*insert date 30 days after date of publication in the FEDERAL REGISTER*].

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service. Written comments should be submitted via email to *ITP.Fowler@noaa.gov*.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments, including all attachments, must not exceed a 25-megabyte file size. All comments received are a part of the public record and will generally be posted online at *www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act* without change. All personal identifying information (*e.g.*, name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

FOR FURTHER INFORMATION CONTACT: Amy Fowler, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act*. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

The MMPA prohibits the "take" of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq*.) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are proposed or, if the taking is

limited to harassment, a notice of a proposed incidental harassment authorization is provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other "means of effecting the least practicable adverse impact" on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (referred to in shorthand as "mitigation"); and requirements pertaining to the mitigation, monitoring and reporting of the takings are set forth. The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq*.) and NOAA Administrative Order (NAO) 216-6A, NMFS must review our proposed action (*i.e.*, the issuance of an IHA) with respect to potential impacts on the human environment.

This action is consistent with categories of activities identified in Categorical Exclusion B4 (IHAs with no anticipated serious injury or mortality) of the Companion Manual for NOAA Administrative Order 216-6A, which do not individually or cumulatively have the potential for significant impacts on the quality of the human environment and for which we have not identified any extraordinary circumstances that would preclude this categorical exclusion. Accordingly, NMFS has preliminarily determined that the issuance of the proposed IHAs qualifies to be categorically excluded from further NEPA review.

We will review all comments submitted in response to this notice prior to concluding our NEPA process or making a final decision on the IHA requests.

Summary of Request

On July 21, 2021, NMFS received two requests from the City for an IHA to take marine mammals incidental to the Pier 63 Removal Project and, separately, the Pier 58 Reconstruction Project on the waterfront in downtown Seattle, Washington. The City submitted revised applications for each project on September 29, 2021 and January 3, 2022. Both applications were deemed adequate and complete on January 26, 2022. The City's request is for take of a small number of 12 species of marine mammals, by Level B harassment only for the Pier 63 Removal Project, and by Level A and Level B harassment for the Pier 58 Reconstruction Project. Neither the City nor NMFS expects serious injury or mortality to result from these activities and, therefore, IHAs are appropriate.

Description of Proposed Activities

Overview

The City is proposing to reconstruct Waterfront Park along the Elliott Bay shoreline in Seattle, Washington. When replaced, Waterfront Park will be renamed Pier 58 in reference to the original structure and to avoid confusion with the larger waterfront park promenade that will be reconstructed along Alaskan Way. The City intends to repair structural and safety deficiencies and optimize public access and recreational uses of the piers, including reconfiguring Waterfront Park to better accommodate programming while providing views of Elliott Bay toward the Olympic Mountain Range. The Pier 58 reconstruction project includes vibratory removal of existing in-water piles and vibratory and impact installation of new piles to support the expanded overwater structure.

The City also plans to remove Pier 63 from the downtown Seattle waterfront. The structural integrity of the pier has deteriorated and the pier has been closed to the public

for safety. Removing Pier 63 will leave the nearshore environment open for improved ecosystem function and salmonid migration. The project includes vibratory removal of existing in-water piles; no plans have been made to reconstruct Pier 63, therefore no new piles will be installed.

The City submitted an individual IHA application for each project. However, given the City applied for both projects concurrently, the projects' close proximity to each other, and similarities in the proposed activities and potential impacts on marine mammals, NMFS is using this single **Federal Register** notice to solicit public comments on the issuance of the two similar, but separate, IHAs.

Dates and Duration

In-water work at both piers will occur during the in-water work window designated by NMFS, the U.S. Army Corps of Engineers, and the Washington State Department of Fish and Wildlife, which is imposed to avoid in-water construction when Endangered Species Act (ESA)-listed juvenile salmonids are most likely to be present. For the Seattle waterfront, this window is anticipated to be September 1 through February 15. The City expects Pier 58 reconstruction (including above-water construction that does not have the potential to take marine mammals) to take a little over a year to complete, from August 2022 to December 2023, with a total of 70 days of in-water work expected during the designated window. Funding for this project has been secured. Pier 63 will be removed during one in-water work season, with a total of 47 days of in-water work expected. Pier 63 may be removed during the September 2022 to February 2023 or September 2023 to February 2024 work window, depending on when funding is made available. Both IHAs would be valid from August 1, 2022 through July 31, 2023. If funding for Pier 63 removal is not authorized during that period, the City will request the IHA be reissued for the following year. Due to this possibility, the analysis that follows for the Pier 63 Removal Project considers possible effects on marine mammals during

either the August 2022 through July 2023 period or the August 2023 through July 2024 period, based on the current best available science.

Specific Geographic Region

Both piers are located along the Seattle waterfront on Elliott Bay, which is an 8 square mile (mi^2) (21 square kilometer (km^2)) urban embayment in central Puget Sound. Pier 58 is approximately ¼ mile (0.4 km) north of Pier 63, with several occupied piers in between. The Seattle waterfront includes land and piers used for businesses, residences, transportation facilities (*e.g.*, ferries, cargo ships, cruise ships), public services (*e.g.*, fire station, utilities), city parks, and other recreational elements. West Point and Alki Point are considered the northern and southern entrances of Elliott Bay, respectively, with downtown Seattle serving as the eastern boundary of the bay. Bainbridge Island is located approximately 7 miles (11.3 km) to the west of downtown Seattle. The inner bay receives fresh water from the Duwamish River and most of the stormwater runoff from approximately 26 mi^2 (67 km^2) of highly developed land in metropolitan Seattle. Elliott Bay is an important industrial region and home to the Port of Seattle, which, coupled with the Port of Tacoma located approximately 22 miles (35 km) to the south, ranked as the nation's fifth busiest U.S. seaport in 2020 (Northwest Seaport Alliance, 2021). Water depths in the area range from less than 10 feet (ft; 3.05 meters (m)) along the seawall to nearly 600 ft (183 m) at the outer extent of the bay.

Detailed Description of Specific Activities

Waterfront Park (hereafter referred to as Pier 58) was a public pier with substantial structural deficiencies. The pier pulled away from the waterfront in August 2020 and was closed to public access. Based on the known structural deficiencies, the City determined that emergency demolition was required for public safety. During initial demolition work in September 2020, a substantial portion of the pier collapsed into the water, thus necessitating an additional in-water activity of concrete demolition. The City

conducted marine mammal monitoring during the emergency demolition work to avoid take of Southern Resident killer whales (*Orcinus orca*) and document occurrence and take of other marine mammals. The City removed the minimum number of piles and over-water structures necessary to protect the integrity of the seawall and maintain a safe environment. The remainder of the existing piles will be removed and replaced under the proposed IHA.

Pier 58 will be reconstructed to maintain public park space and improve access, safety, and flexibility in use, while offering expansive views of Elliott Bay and the Olympic Mountains. The reconstructed pier will be 47,280 square feet and will include the installation of 120 permanent 30-inch steel piles. The decking will consist of both pre-cast concrete panels and a cast-in-place concrete deck slab. There will also be a 770 square foot area of grating to provide additional lighting to the existing intertidal salmon migratory corridor. The new park will feature a new public plaza, maintain the Fitzgerald fountain, and create a new children's play area, seating areas, and a large lawn and trees in planters to provide shade.

The reconstructed Pier 58 is also designed with an approximately 4,962-square-foot open water habitat area to provide natural lighting of the shallow water habitat near the shore (located at depths less than -10 feet mean lower-low water (MLLW)) that will enhance nearshore habitat for a variety of species, such as juvenile salmon that use the nearshore area during migratory periods and comprise part of the prey base for many marine mammal species. An expanded intertidal habitat bench with the top surface at MLLW, sloping to a foundation rock sill would be installed in this new open water area to facilitate recruitment of native invertebrate and algal species. Due to the new configuration, the replacement pier will cover up an existing habitat substrate patch that was created as part of the Elliot Bay Seawall Project. To address loss of function of this habitat feature, the City will install an equal area of new habitat substrate enhancement to

replicate the existing feature adjacent to Pier 58, further north between the Seattle Aquarium (Pier 59) and Pier 62. The new substrate enhancement will improve benthic habitat for juvenile crabs and other invertebrates and will generally improve productivity and support food web processes. The substrate enhancement will consist of an approximately 2,000 square foot, 2-foot thick layer of 1.5-inch subtidal habitat gravel and will be located at elevations between approximately -10 to -20 feet MLLW. This habitat work will not result in the take of marine mammals.

A total of 31 existing steel H-piles and timber piles will be removed in whole, wherever possible, by pulling the piles using a vibratory extraction method or clamshell bucket. If a timber pile breaks above the mudline during removal, the City will attempt to pull the remainder of the pile in a way that minimizes disturbance of sediment; otherwise, it will be cut below the mudline. All creosote-treated wood and steel that is removed will be disposed of in accordance with appropriate regulations.

Once all existing piles have been removed, the City will begin the reconstruction by using a vibratory hammer to install 100 24-inch steel pipe template piles, which will all subsequently be removed using the same vibratory hammer. The City anticipates the contractor will use approximately 6 template piles at a time, for every 4 permanent piles, so that the template piles can be re-used. The City will then install a total of 120 permanent 30-inch steel pipe piles using a vibratory hammer, followed by an impact hammer to "proof" the pilings to their maximum depth and load-bearing capacity. All impact pile driving will be conducted using a bubble curtain surrounding the pile (see **Proposed Mitigation**). The City does not plan to conduct pile driving with multiple hammers concurrently.

Table 1. Summary of Piles to be Installed and Removed at Pier 58

Pile Type and Size	Method	Number of Piles	Maximum Piles per Day	Duration or Strikes per Pile	Maximum Days of Pile Driving

Steel H-pile, 14-inch timber pile	Vibratory removal	31	20	20 minutes	10
24-inch steel pipe pile	Vibratory installation	100[a]	10	15 minutes	10
24-inch steel pipe pile	Vibratory removal	100[a]	10	5 minutes	10
30-inch steel pipe pile	Vibratory installation	120[b]	4	45 minutes	40[c]
30-inch steel pipe pile	Impact installation	120[b]	3	400 strikes	40[c]
Total	Vibratory and impact	251		-	70

[a] These same 100 piles will be installed and later removed.
[b] These same 120 piles will be installed first using a vibratory hammer, than finished with an impact hammer.
[c] Vibratory and impact installation of 30-inch piles will occur on the same 40 days.

Pier 63 was previously used as a public open space where concerts and special events were hosted, but the pier has deteriorated and can no longer support heavy loads and is no longer in use. The City plans to demolish and remove the existing pier (with a total over-water area of 35,108 square feet), including removal of 900 14-inch timber piles and 8 30-inch steel pipe piles. During demolition, broken piles and debris from previous pier configurations will also be removed, as feasible, to comply with Washington State Department of Natural Resources lease terms. The number of broken piles to be removed is unknown but would be removed with a clamshell bucket and pulled or cut below the mudline. Broken piles and debris removed without the use of a vibratory hammer is not expected to result in take of marine mammals.

During pile removal for Pier 63, decking and framing will be removed using heavy equipment or by workers on the deck. Timber piles will be removed in whole, wherever possible, by pulling the piles using a vibratory extraction method or clamshell bucket. If a pile breaks above the mudline during removal, then an attempt will be made to pull the remainder of the pile in a way that minimizes disturbance of sediments; otherwise, it will be cut below the mudline. All creosote-treated wood that is removed will be disposed of in accordance with appropriate regulations. Steel piles will be

removed using vibratory extraction. The vibratory hammer will be positioned on a barge adjacent to the pier.

Table 2. Summary of Piles to be Removed at Pier 63

Pile Type	Number of Piles	Maximum Piles Removed per Day	Duration per Pile (minutes)	Maximum Days of Pile Removal
14-inch timber pile	900	20	20	45
30-inch steel pipe pile	8	4	45	2

Proposed mitigation, monitoring, and reporting measures are described in detail later in this document (please see **Proposed Mitigation** and **Proposed Monitoring and Reporting**).

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of the applications summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of the potentially affected species, and can be found at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act*. All of this information was fully considered and we refer the reader to these descriptions, incorporated here by reference, instead of reprinting the information. Additional information regarding population trends and threats may be found in NMFS's Stock Assessment Reports (SARs; *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*) and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS's website (*https://www.fisheries.noaa.gov/find-species)*.

Table 3 lists all species or stocks for which take is expected and proposed to be authorized for both proposed IHAs, and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological

removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2021). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS's SARs). While no serious injury or mortality is anticipated or authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species or stocks and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS's stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All values for each managed stock presented in Table 3 are the most recent available at the time of publication and are available in the 2020 SARs (Carretta *et al*., 2021, Muto *et al*., 2021) and draft 2021 SARs (available online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/draft-marine-mammal-stock-assessment-reports*).

Table 3. Marine Mammals That Could Occur in the Survey Area

Common name	Scientific name	Stock	ESA/MMPA status; Strategic (Y/N)[1]	Stock abundance (CV, N_{min}, most recent abundance survey)[2]	PBR	Annual M/SI[3]
Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales)						
Family Eschrichtiidae						
Gray whale	*Eschrichtius robustus*	Eastern N Pacific	-, -, N	26,960 (0.05, 25,849, 2016)	801	131
Family Balaenopteridae (rorquals)						
Humpback whale	*Megaptera novaeangliae*	California/Oregon/Washington	E, D, Y	4,973 (0.05, 4,776, 2018)	28.7	≥ 48.6
Minke whale	*Balaenoptera acutorostrata*	California/Oregon/Washington	-, -, N	915 (0.792, 509, 2018)	4.1	≥ 0.59
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae						

Long Beaked Common Dolphin	*Delphinus capensis*	California	-, -, N	83,379 (0.216, 69,636, 2018)	668	≥29.7
Bottlenose Dolphin	*Tursiops truncatus*	California Coastal	-, -, N	453 (0.06, 346, 2011)	2.7	≥2.0
Killer Whale	*Orcinus orca*	Southern Resident	E, D, Y	72 (N/A, 72, 2020)	0.13	≥0.4
		West Coast Transient	-, -, N	349[4] (N/A, 349, 2018)	3.5	0.4
Family Phocoenidae (porpoises)						
Harbor Porpoise	*Phocoena phocoena*	Washington Inland Waters	-, -, N	11,233 (0.37, 8,308, 2015)	66	≥7.2
Dall's Porpoise	*Phocoenoides dalli*	California/Oregon/Washington	-, -, N	16,498 (0.61, 10,286, 2019)	99	≥0.66
Order Carnivora – Superfamily Pinnipedia						
Family Otariidae (eared seals and sea lions)						
California Sea Lion	*Zalophus californianus*	U.S.	-, -, N	257,606 (N/A,233,515, 2014)	14,011	>320
Steller Sea Lion	*Eumetopias jubatus*	Eastern	-, -, N	43,201[5] (see SAR, 43,201, 2017)	2,592	112
Family Phocidae (earless seals)						
Harbor Seal	*Phoca vitulina*	Washington Northern Inland Waters	-, -, N	11,036[6] (UNK, UNK, 1999)	UND	9.8
Northern Elephant Seal	*Mirounga angustirostris*	California Breeding	-, -, N	187,386 (N/A, 85,369, 2013)	5,122	13.7

[1] ESA status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

[2] NMFS marine mammal stock assessment reports online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region.* CV is coefficient of variation; Nmin is the minimum estimate of stock abundance.

[3] These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.*, commercial fisheries, ship strike). Annual mortality/serious injury (M/SI) often cannot be determined precisely and is in some cases presented as a minimum value or range.

[4] Based on counts of individual animals identified from photo-identification catalogues. Surveys for abundance estimates of these stocks are conducted infrequently.

[5] Best estimate of pup and non-pup counts, which have not been corrected to account for animals at sea during abundance surveys.

[6] The abundance estimate for this stock is greater than eight years old and is therefore not considered current. PBR is considered undetermined for this stock, as there is no current minimum abundance estimate for use in calculation. We nevertheless present the most recent abundance estimates, as these represent the best available information for use in this document.

As indicated above, all 12 species (with 13 managed stocks) in Table 3 temporally and spatially co-occur with the activities to the degree that take is reasonably likely to occur, and we propose authorizing it. The Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) is a rare visitor to the inland waters of Puget Sound (Orca Network, 2021). However, they have not been observed during recent marine mammal monitoring for

projects in Elliott Bay (*e.g.*, WSDOT 2021; Anchor QEA 2019) and are considered unlikely to occur in the area during the City's proposed activities. The City has not requested take of Pacific white-sided dolphins for either project and NMFS does not anticipate or propose to authorize take of this species. Therefore, Pacific white-sided dolphins are not discussed further in this document.

Humpback Whale

Humpback whales are found in coastal waters of Washington as they migrate from feeding grounds in Alaska to California to winter breeding grounds in Mexico. Humpbacks used to be considered only rare visitors to Puget Sound. In 1976 and 1978, two sightings were reported in Puget Sound and one sighting was reported in 1986 (Osborne *et al*., 1988; Calambokidis and Steiger 1990; Calambokidis and Baird 1994). Humpback whale occurrence in Puget Sound has been steadily increasing since 2000, with some individuals remaining in the area through the winter (Calambokidis *et al.*, 2018). Prior to 2016, humpback whales were listed under the ESA as an endangered species worldwide. Following a 2015 global status review (Bettridge *et al*., 2015), NMFS delineated 14 distinct population segments (DPSs) with different listing statuses (81 FR 62259; September 8, 2016) pursuant to the ESA. The DPSs that occur in U.S. waters do not necessarily equate to the existing stocks designated under the MMPA and shown in Table 1. Because MMPA stocks cannot be portioned, *i.e*., parts managed as ESA-listed while other parts managed as not ESA-listed, until such time as the MMPA stock delineations are reviewed in light of the DPS designations, NMFS considers the existing humpback whale stocks under the MMPA that overlap with endangered or threatened DPSs to be depleted for MMPA management purposes (*e.g*., selection of a recovery factor, stock status). All humpback whales in the project areas would be from the California/Oregon/Washington stock. Within Puget Sound, three DPSs may occur and be taken incidental to the City's activities: the Hawai'i DPS (not listed), Mexico DPS

(threatened), and Central America DPS (endangered). According to Wade *et al.* (2021), the probability that humpback whales encountered in Washington and Southern British Columbia waters are as follows: Hawai'i DPS, 69 percent; Mexico DPS, 25 percent; and Central America DPS, 6 percent. We therefore assume that the numbers of humpback whales taken incidental to the City's proposed activities would fall under the same relative proportions. Critical habitat for Mexico and Central America DPS humpback whales has been established on the outer coast of Washington (86 FR 21082; April 21, 2021) but none has been designated within Puget Sound.

Entanglement in fishing gear and marine debris is considered a primary threat to humpback whales in the northeast Pacific. Entanglements are the most commonly identified cause of death and injury among humpback whales along California, Oregon, and Washington (Carretta *et al*. 2013, 2019), and probably cause a modest reduction in the size or growth rate of the Central America and Mexico DPSs (Bettridge *et al*., 2015). Humpbacks were the second most frequently entangled whale species (after gray whales) in this region from 1982 to 2013, averaging 2.1 reports per year (Sato and Wiley, 2021). However, actual numbers of entanglements were likely much higher, as indicated by photographic data showing scarring from past incidents on half or more of the humpback whales occurring off these states (Robbins *et al*., 2007). Most humpback entanglements in Washington involve trap/pot gear, especially from commercial Dungeness crab fisheries (Saez *et al*., 2013; NMFS 2017).

Humpback whales are one of the most commonly vessel-struck whale species in some areas of the world (Jensen and Silber 2004; Neilson *et al*., 2012; Hill *et al*., 2017). For example, in Alaskan and Hawaiian waters, members of the Hawaii DPS experienced an average of at least 4.0 deaths and serious injuries per year because of collisions from 2012 to 2016 (Muto *et al*., 2019). In Washington, just two humpback whales were reported killed by vessel strikes from 1980 to 2017 (Douglas *et al*., 2008; Carretta *et al*.,

2013, 2019). The state has several areas where heavy vessel traffic poses a higher collision risk for humpback whales. These include the mouths of the Strait of Juan de Fuca and Columbia River, the north-south shipping lane that parallels the outer coast, and the Strait of Juan de Fuca and other parts of the Salish Sea (Williams and O'Hara 2010; Nichol *et al*., 2017; Rockwood *et al*., 2017).

Gray Whale

Gray whales generally spend the summer and fall in Arctic feeding grounds and winter to early spring in Mexican breeding areas. Between October and February, the species migrates south along the U.S. West Coast, returning north between February and July (Carretta *et al.*, 2021). A subpopulation of the Eastern North Pacific stock, referred to as the Pacific Coast Feeding Group (PCFG), remains along the Washington and Oregon coast to feed for extended periods while the rest of the stock continues along their migratory path (Calambokidis *et al.*, 2018). Like humpback whales, occurrence of gray whales in Puget Sound has been steadily increasing in recent years. Occurrence of gray whales in Puget Sound is generally highest between February and May. Most gray whales remain further north in Puget Sound, concentrating in the waters around Whidbey Island, but some venture south, including into Elliott Bay near the proposed activities (Orca Network, 2021).

Biologically Important Areas (BIAs) for feeding gray whales along the coasts of Washington, Oregon, and California have been identified, including northern Puget Sound, Northwestern Washington, and Grays Harbor in Washington, Depoe Bay and Cape Blanco and Orford Reef in Oregon, and Point St. George in California; most of these areas are of importance from late spring through early fall (Calambokidis *et al*., 2015). BIAs have also been identified for migrating gray whales along the entire coasts of Washington (including the inland waters of Puget Sound), Oregon, and California;

although most whales travel within 10 km from shore, the BIAs were extended out to 47 km from the coastline (Calambokidis *et al*., 2015).

On May 30, 2019, NMFS declared an unusual mortality event (UME) for gray whales after elevated numbers of strandings occurred along the U.S. west coast. As of January 7, 2022, a total of 502 stranded gray whales have been reported, including 256 in the United States (117 in Alaska, 56 in Washington, 12 in Oregon, and 71 in California), 225 in Mexico, and 21 in Canada. Full or partial necropsy examinations were conducted on a subset of the whales. Preliminary findings in several of the whales have shown evidence of emaciation. These findings are not consistent across all of the whales examined, so more research is needed. The UME is ongoing, and NMFS continues to investigate the cause(s). Additional information about the UME is available at *https://www.fisheries.noaa.gov/national/marine-life-distress/2019-2020-gray-whale-unusual-mortality-event-along-west-coast*.

Minke Whale

The International Whaling Commission (IWC) recognizes three stocks of minke whales in the North Pacific: The Sea of Japan/East China Sea, the rest of the western Pacific west of 180° N, and the remainder of the Pacific (Donovan 1991). Minke whales are relatively common in the Bering and Chukchi seas and in the Gulf of Alaska, but are not considered abundant in any other part of the eastern Pacific (Brueggeman *et al*., 1990). In the far north, minke whales are thought to be migratory, but they are believed to be year-round residents in coastal waters off the west coast of the United States (Dorsey *et al*., 1990).

Minke whales are reported in Washington inland waters year-round, although few are reported in the winter (*i.e.*, during the anticipated in-water work window for these projects; Calambokidis and Baird 1994). They are relatively common in the San Juan Islands and Strait of Juan de Fuca (especially around several of the banks in both the

central and eastern Strait), but are relatively rare in Puget Sound and the Orca Network has no sighting records of minke whales in the project areas.

Killer Whale

There are three distinct ecotypes, or forms, of killer whales recognized in the north Pacific: resident, transient, and offshore. The three ecotypes differ morphologically, ecologically, behaviorally, and genetically. Resident killer whales exclusively prey upon fish, with a clear preference for salmon (Ford and Ellis 2006; Hanson *et al*., 2010; Ford *et al*., 2016), while transient killer whales exclusively prey upon marine mammals (Caretta *et al*., 2019). Less is known about offshore killer whales, but they are believed to consume primarily fish, including several species of shark (Dahlheim *et al*., 2008). Currently, there are eight killer whale stocks recognized in the U.S. Pacific (Carretta *et al.*, 2021; Muto *et al.*, 2021). Of those, individuals from the Southern Resident stock and West Coast Transient stock may occur in the Seattle area and be taken incidental to the City's proposed activities.

The Southern Resident killer whale (SRKW) population is comprised of three pods, J, K, and L pods, which typically travel independent of each other. The stock occurs for part of the year in the inland waterways of the Salish Sea, including Puget Sound, the Strait of Juan de Fuca, and the southern Strait of Georgia mostly during the spring, summer, and fall. Their movement patterns appear related to the seasonal availability of prey, especially Chinook salmon (*Oncorhynchus tshawytscha*). They also move to coastal waters, primarily off Washington and British Columbia, in search of suitable prey, and have been observed as far as central California and southeast Alaska (NMFS 2019). During the fall, SRKW, especially J pod, expand their movements into Puget Sound, likely taking advantage of chum (*Oncorhynchus keta*) and Chinook salmon runs (Hanson *et al.*, 2021).

The SRKW DPS was listed as endangered under the ESA in 2005 after a nearly 20 percent decline in abundance between 1996 and 2001 (70 FR 69903; November 18, 2005). As compared to stable or growing populations, the DPS reflects lower fecundity and has demonstrated little to no growth in recent decades, and in fact has declined further since the date of listing (NMFS 2019). The population abundance listed in the draft 2021 SARs is 72 individuals, from the July 1, 2020 annual census conducted by the Center for Whale Research (Carretta *et al.*, 2021); since that date, two adult SRKW have died or are presumed dead, and three calves were born, bringing the current abundance to 73 whales (Orca Network, 2021).

Designated ESA critical habitat for SRKW includes the inland waters of Washington relative to a contiguous shoreline delimited by the line at a depth of 6.1 m relative to extreme high water (71 FR 69054; November 29, 2006). The Seattle waterfront is in the Puget Sound segment of the designated critical habitat, which is defined as the area south of the Deception Pass Bridge, west of the entrance to Admiralty Inlet, and north of the Hood Canal Bridge. SRKW have been observed in this area in all seasons but most occurrence in this area typically correlates with fall salmon runs, which occur during the anticipated in-water work window for these projects (NMFS 2006).

In contrast to SRKW, which exclusively prey on fish, the main diet of transient killer whales consists of marine mammals. Within Puget Sound, transient killer whales primarily hunt pinnipeds and porpoises, though some groups will occasionally target larger whales. The West Coast Transient stock of killer whales occurs from California through southeast Alaska (Muto *et al*., 2021). The seasonal movements of transients are largely unpredictable, although there is a tendency to investigate harbor seal haulouts off Vancouver Island more frequently during the pupping season in August and September (Baird 1994; Ford 2014). Transient killer whales have been observed in central Puget Sound in all months (Orca Network 2021).

Bottlenose Dolphin

Bottlenose dolphins are distributed worldwide from approximately 45° N to 45° S. Bottlenose dolphins inhabiting west coast U.S. waters are considered to be in either the California coastal stock, which ranges from Mexico to the San Francisco area within approximately 1 kilometer of shore, or the California/Oregon/Washington offshore stock, which is most commonly found along the California coast, northward to about the Oregon border. NMFS offshore surveys from 1991 to 2014 resulted in no sightings during study transects off the Oregon or Washington coasts (Carretta *et al*., 2019). In September 2017, however, multiple sightings of a bottlenose dolphin throughout the Puget Sound and in Elliott Bay were reported to Cascadia Research Collective and Orca Network. One of the individuals was identified as belonging to the California coastal stock (Cascadia Research Collective, 2017). Bottlenose dolphins are considered rare in Puget Sound but occasional sightings have continued since the initial reports in 2017 (Orca Network, 2021).

Long-Beaked Common Dolphin

Long-beaked common dolphins are commonly found along the U.S. West Coast, from Baja, California (including the Gulf of California), northward to about central California (Carretta *et al.*, 2020). The Salish Sea is not considered part of their typical range (Carretta *et al.*, 2020), but there have been reports of long-beaked common dolphins in inland waters. Two individual common dolphins were observed in August and September of 2011 (Whale Museum, 2015). The first record of a pod of long-beaked common dolphins in this area came in the summer of 2016. Beginning on June 16, 2016 long-beaked common dolphins were observed near Victoria, B.C. Over the following weeks, a pod of 15 to 20 (including a calf) was observed in central and southern Puget Sound. They were positively identified as long-beaked common dolphins (Orca Network 2016). Two long-beaked common dolphins were observed by Washington State

Department of Transportation (WSDOT) marine mammal monitors during construction at Colman Dock (Pier 52) during the 2017-18 construction window (WSDOT 2019).

Harbor Porpoise

In the eastern North Pacific Ocean, harbor porpoise are found in coastal and inland waters from Point Barrow, along the Alaskan coast, and down the west coast of North America to Point Conception, California (Gaskin 1984). Harbor porpoise are known to occur year-round in the inland trans-boundary waters of Washington and British Columbia, Canada (Osborne *et al*., 1988), and along the Oregon/Washington coast (Barlow 1988, Barlow *et al*., 1988, Green *et al*., 1992). There was a significant decline in harbor porpoise sightings within southern Puget Sound between the 1940s and 1990s but sightings have increased seasonally in the last 10 years (Carretta *et al*., 2019). Annual winter aerial surveys conducted by the Washington Department of Fish and Wildlife from 1995 to 2015 revealed an increasing trend in harbor porpoise in Washington inland waters, including the return of harbor porpoise to Puget Sound. The data suggest that harbor porpoise were already present in Juan de Fuca, Georgia Straits, and the San Juan Islands from the mid-1990s to mid-2000s, and then expanded into Puget Sound and Hood Canal from the mid-2000s to 2015, areas they had used historically but abandoned. Changes in fishery-related entanglement was suspected as the cause of their previous decline and more recent recovery, including a return to Puget Sound (Evenson *et al*., 2016). Seasonal surveys conducted in spring, summer, and fall 2013-2015 in Puget Sound and Hood Canal documented substantial numbers of harbor porpoise in Puget Sound. Observed porpoise numbers were twice as high in spring as in fall or summer, indicating a seasonal shift in distribution of harbor porpoise (Smultea 2015). The reasons for the seasonal shift and for the increase in sightings is unknown. Marine mammal monitors have reported few sightings of harbor porpoises in Elliott Bay during recent construction projects at the Seattle waterfront (*e.g.*, WSDOT 2019).

Dall's Porpoise

Dall's porpoises are endemic to temperate waters of the North Pacific Ocean. Off the U.S. west coast, they are commonly seen in shelf, slope, and offshore waters (Morejohn 1979). Sighting patterns from aerial and shipboard surveys conducted in California, Oregon, and Washington (Green *et al*., 1992, 1993; Forney and Barlow 1998; Barlow 2016) suggest that north-south movement between these states occurs as oceanographic conditions change, both on seasonal and inter-annual time scales. Dall's porpoise are considered rare in Puget Sound; no observations of Dall's porpoises have been reported during recent construction projects at the Seattle waterfront (*e.g.*, WSDOT 2019).

California Sea Lion

The California sea lion is the most frequently sighted pinniped found in Washington waters and uses haul-out sites along the outer coast, Strait of Juan de Fuca, and in Puget Sound. Haul-out sites are located on jetties, offshore rocks and islands, log booms, marina docks, and navigation buoys. This species also may be frequently seen resting in the water, rafted together in groups in Puget Sound. Only male California sea lions migrate into Pacific Northwest waters, with females remaining in waters near their breeding rookeries off the coast of California and Mexico. The California sea lion was considered rare in Washington waters prior to the 1950s. More recently, peak numbers of 3,000 to 5,000 animals move into the Salish Sea during the fall and remain until late spring, when most return to breeding rookeries in California and Mexico (Jeffries *et al*., 2000).

California sea lions are often observed in the area of potential effects and are known to be comfortable and seemingly curious around human activities. There are four documented haul-out areas near Bainbridge Island, approximately 6 miles (9.6 km) from Pier 63, and two documented haul-out areas between Bainbridge Island and Magnolia.

The haul-outs consist of buoys and floats, and some are within the area of potential effects, but at the outer extent, and some are just outside the area of potential effects (Jefferies *et al*., 2000). California sea lions are regularly observed in Elliott Bay, especially around two navigational buoys near Alki Point, at the southwest edge of Elliott Bay. During construction at Pier 62 in 2018 and 2019, between 0 and 31 California sea lions were observed in the project area per day, with an average of 6 per day. More than half of the reported takes of California sea lions during this project were animals near Alki Point (Anchor QEA 2018, 2019).

Steller Sea Lion

Steller sea lions range along the North Pacific Rim from northern Japan to California (Loughlin *et al*., 1984). There are two separate stocks of Steller sea lions, the Eastern U.S. stock, which occurs east of Cape Suckling, Alaska (144° W), and the Western U.S. stock, which occurs west of that point. Only the Western stock of Steller sea lions, which is designated as the Western DPS of Steller sea lions, is listed as endangered under the ESA (78 FR 66139; November 4, 2013). Unlike the Western U.S. stock of Steller sea lions, there has been a sustained and robust increase in abundance of the Eastern U.S. stock throughout its breeding range. The eastern stock of Steller sea lions has historically bred on rookeries located in Southeast Alaska, British Columbia, Oregon, and California. However, within the last several years a new rookery has become established on the outer Washington coast (at the Carroll Island and Sea Lion Rock complex), with more than100 pups born there in 2015 (Muto *et al.*, 2020).

Steller sea lions use haul-out locations in Puget Sound, and may occur at the same haul-outs as California sea lions, but are considered rare visitors to Elliott Bay and the Seattle waterfront area. Few Steller sea lions have been observed during monitoring of recent construction projects in the area; typically fewer than 5 total observations per year (*e.g.*, Anchor QEA 2018, 2019). However, a total of 54 Steller sea lions were observed

over 99 days of monitoring during the 2017-2018 work season at Colman Dock (Pier 52; WSDOT 2019).

Northern Elephant Seal

Northern elephant seals breed and give birth in California (U.S.) and Baja California (Mexico), primarily on offshore islands (Stewart et al. 1994), from December to March (NOAA 2015). Males migrate to the Gulf of Alaska and western Aleutian Islands along the continental shelf to feed on benthic prey, while females migrate to pelagic areas in the Gulf of Alaska and the central North Pacific Ocean to feed on pelagic prey (Le Boeuf *et al*., 2000). Adults return to land between March and August to molt, with males returning later than females. Adults return to their feeding areas again between their spring/summer molting and their winter breeding seasons (Carretta *et al.*, 2015).

Individual elephant seals have been reported in Elliott Bay and central Puget Sound (*e.g.*, WSDOT 2019) but are generally considered rare in Puget Sound. However, a female elephant seal has been reported hauled-out in Mutiny Bay on Whidbey Island periodically since 2010. She was observed alone for her first three visits to the area, but in March 2015, she was seen with a pup. Since then, she has produced two more pups, born in 2018 and 2020. Northern elephant seals generally give birth in January but this individual has repeatedly given birth in March. She typically returns to Mutiny Bay in April and May to molt. Her pups have also repeatedly returned to haul-out on nearby beaches (Orca Network 2020).

Harbor Seal

Harbor seals inhabit coastal and estuarine waters off Baja California, north along the western coasts of the continental U.S., British Columbia, and Southeast Alaska, west through the Gulf of Alaska and Aleutian Islands, and in the Bering Sea north to Cape Newenham and the Pribilof Islands (Carretta *et al.*, 2014). They haul out on rocks, reefs,

beaches, and drifting glacial ice and feed in marine, estuarine, and occasionally fresh waters. Harbor seals generally are non-migratory, with local movements associated with such factors as tides, weather, season, food availability, and reproduction (Scheffer and Slipp 1944; Fisher 1952; Bigg 1969, 1981). Within U.S. west coast waters, five stocks of harbor seals are recognized: 1) Southern Puget Sound (south of the Tacoma Narrows Bridge); 2) Washington Northern Inland Waters (including Puget Sound north of the Tacoma Narrows Bridge, the San Juan Islands, and the Strait of Juan de Fuca); 3) Hood Canal; 4) Oregon/Washington Coast; and 5) California. Harbor seals in the project areas would be from the Washington Northern Inland Waters stock.

Harbor seals are the only pinniped species that occurs year-round and breeds in Washington waters (Jeffries *et al.*, 2000). Pupping seasons vary by geographic region, with pups born in coastal estuaries (Columbia River, Willapa Bay, and Grays Harbor) from mid-April through June; Olympic Peninsula coast from May through July; San Juan Islands and eastern bays of Puget Sound from June through August; southern Puget Sound from mid-July through September; and Hood Canal from August through January (Jeffries *et al*., 2000). The most recent estimate for the Washington Northern Inland Waters Stock is 11,036 based on surveys conducted in 1999. There are no current estimates of abundance for this stock but the population is thought to be stable (Carretta *et al.*, 2014).

There is one documented harbor seal haulout area near Bainbridge Island, approximately 6 miles west of Piers 58 and 63. The haulout, which is estimated at less than 100 animals, consists of intertidal rocks and reef areas around Blakely Rocks and is within the area of potential effects but at the outer extent near Bainbridge Island (Jefferies *et al*., 2000). Harbor seals are a commonly observed marine mammal in the area of potential effects and are known to be comfortable and seemingly curious around human activities. Observations of harbor seals were reported during many recent construction

projects along the Seattle waterfront. During two seasons of construction at Pier 62, up to 54 harbor seals were observed per day, with an average of 5 individuals per day (Anchor QEA 2019).

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.*, low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in Table 4.

Table 4. Marine Mammal Hearing Groups (NMFS, 2018).

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, *Kogia*, river dolphins, cephalorhynchids, *Lagenorhynchus cruciger* & *L. australis*)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz

***** Represents the generalized hearing range for the entire group as a composite (*i.e.,* all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall *et al.* 2007) and PW pinnipeds (approximation).

The pinniped functional hearing group was modified from Southall *et al*. (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al*., 2006; Kastelein *et al*., 2009; Reichmuth and Holt, 2013).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information. Twelve marine mammal species (8 cetacean and 4 pinniped (2 otariid and 2 phocid) species) have the reasonable potential to co-occur with the proposed survey activities. Please refer to Table 3. Of the cetacean species that may be present, 3 are classified as low-frequency cetaceans (*i.e*., all mysticete species), 3 are classified as mid-frequency cetaceans (*i.e*., all delphinid species), and 2 are classified as high-frequency cetaceans (*i.e*., all porpoise species).

Potential Effects of Specified Activities on Marine Mammals and their Habitat

This section includes a discussion of the ways that components of the specified activities may impact marine mammals and their habitat. The **Estimated Take** section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by these activities. The **Negligible Impact Analysis and Determination** section considers the content of this section, the **Estimated Take** section,

and the **Proposed Mitigation** section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and how those impacts on individuals are likely to impact marine mammal species or stocks.

Acoustic effects on marine mammals during the specified activities can occur from impact pile driving and vibratory driving and removal. The effects of underwater noise from the City's proposed activities have the potential to result in Level A or Level B harassment of marine mammals in the action areas.

Description of Sound Sources

The marine soundscape is comprised of both ambient and anthropogenic sounds. Ambient sound is defined as the all-encompassing sound in a given place and is usually a composite of sound from many sources both near and far (ANSI 1995). The sound level of an area is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.*, waves, wind, precipitation, earthquakes, ice, atmospheric sound), biological (*e.g.*, sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.*, vessels, dredging, aircraft, construction).

The sum of the various natural and anthropogenic sound sources at any given location and time – which comprise "ambient" or "background" sound – depends not only on the source levels (as determined by current weather conditions and levels of biological and shipping activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10-20 decibels (dB) from day to day (Richardson *et al.*, 1995). The result is that, depending on the source type and its

intensity, sound from the specified activities may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

In-water construction activities associated with the project would include impact and vibratory pile driving and removal. The sounds produced by these activities fall into one of two general sound types: impulsive and non-impulsive. Impulsive sounds (*e.g.*, explosions, sonic booms, impact pile driving) are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI, 1986; NIOSH, 1998; NMFS, 2018). Non-impulsive sounds (*e.g.*, machinery operations such as drilling or dredging, vibratory pile driving, underwater chainsaws, and active sonar systems) can be broadband, narrowband or tonal, brief or prolonged (continuous or intermittent), and typically do not have the high peak sound pressure with raid rise/decay time that impulsive sounds do (ANSI 1995; NIOSH 1998; NMFS 2018). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.*, Ward 1997 in Southall *et al*., 2007).

Two types of hammers would be used on this project, impact and vibratory. Impact hammers operate by repeatedly dropping and/or pushing a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is considered impulsive. Vibratory hammers install piles by vibrating them and allowing the weight of the hammer to push them into the sediment. Vibratory hammers produce non-impulsive, continuous sounds. Vibratory hammering generally produces SPLs 10 to 20 dB lower than impact pile driving of the same-sized pile (Oestman *et al*., 2009). Rise time is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (Nedwell and Edwards, 2002; Carlson *et al*., 2005).

The likely or possible impacts of the City's proposed activities on marine mammals could be generated from both non-acoustic and acoustic stressors. Potential

non-acoustic stressors include the physical presence of the equipment, vessels, and personnel; however, we expect that any animals that approach the project site(s) close enough to be harassed due to the presence of equipment or personnel would be within the Level B harassment zones from pile driving and would already be subject to harassment from the in-water activities. Therefore, any impacts to marine mammals are expected to primarily be acoustic in nature. Acoustic stressors are generated by heavy equipment operation during pile installation and removal (*i.e*., impact and vibratory pile driving and removal).

Acoustic Impacts

The introduction of anthropogenic noise into the aquatic environment from pile driving equipment is the primary means by which marine mammals may be harassed from the City's specified activities. In general, animals exposed to natural or anthropogenic sound may experience physical and psychological effects, ranging in magnitude from none to severe (Southall *et al*., 2007). Generally, exposure to pile driving and removal and other construction noise has the potential to result in auditory threshold shifts and behavioral reactions (*e.g.,* avoidance, temporary cessation of foraging and vocalizing, changes in dive behavior). Exposure to anthropogenic noise can also lead to non-observable physiological responses such as an increase in stress hormones. Additional noise in a marine mammal's habitat can mask acoustic cues used by marine mammals to carry out daily functions such as communication and predator and prey detection. The effects of pile driving and demolition noise on marine mammals are dependent on several factors, including, but not limited to, sound type (*e.g.,* impulsive vs. non-impulsive), the species, age and sex class (*e.g.,* adult male vs. mother with calf), duration of exposure, the distance between the pile and the animal, received levels, behavior at time of exposure, and previous history with exposure (Wartzok *et al.,* 2004; Southall *et al*., 2007). Here we discuss physical auditory effects (threshold shifts)

followed by behavioral effects and potential impacts on habitat. No physiological effects other than PTS are anticipated or proposed to be authorized, and therefore are not discussed further.

NMFS defines a noise-induced threshold shift (TS) as a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). The amount of threshold shift is customarily expressed in dB. A TS can be permanent or temporary. As described in NMFS (2018), there are numerous factors to consider when examining the consequence of TS, including, but not limited to, the signal temporal pattern (*e.g.,* impulsive or non-impulsive), likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS, the magnitude of the TS, time to recovery (seconds to minutes or hours to days), the frequency range of the exposure (*i.e.,* spectral content), the hearing and vocalization frequency range of the exposed species relative to the signal's frequency spectrum (*i.e.,* how animal uses sound within the frequency band of the signal; *e.g.*, Kastelein *et al.,* 2014), and the overlap between the animal and the source (*e.g.,* spatial, temporal, and spectral).

Permanent Threshold Shift (PTS) - NMFS defines PTS as a permanent, irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). Available data from humans and other terrestrial mammals indicate that a 40 dB threshold shift approximates PTS onset (see Ward *et al*., 1958, 1959; Ward, 1960; Kryter *et al.,* 1966; Miller, 1974; Ahroon *et al*., 1996; Henderson *et al*., 2008). PTS levels for marine mammals are estimates, because there are limited empirical data measuring PTS in marine mammals (*e.g.*, Kastak *et al.*, 2008), largely due to the fact that, for various ethical reasons, experiments involving anthropogenic noise exposure at levels inducing PTS are not typically pursued or authorized (NMFS, 2018).

Temporary Threshold Shift (TTS) - TTS is a temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). Based on data from cetacean TTS measurements (see Southall *et al.,* 2007), a TTS of 6 dB is considered the minimum threshold shift clearly larger than any day-to-day or session-to-session variation in a subject's normal hearing ability (Schlundt *et al*., 2000; Finneran *et al*., 2000, 2002). As described in Finneran (2016), marine mammal studies have shown the amount of TTS increases with cumulative sound exposure level (SEL_{cum}) in an accelerating fashion: At low exposures with lower SEL_{cum}, the amount of TTS is typically small and the growth curves have shallow slopes. At exposures with higher SEL_{cum}, the growth curves become steeper and approach linear relationships with the noise SEL.

Depending on the degree (elevation of threshold in dB), duration (*i.e*., recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious (similar to those discussed in auditory masking, below). For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that takes place during a time when the animal is traveling through the open ocean, where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts. We note that reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al.,* 2007), so we can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin, beluga whale (*Delphinapterus leucas*), harbor porpoise, and Yangtze finless porpoise (*Neophocoena asiaeorientalis*)) and five species of pinnipeds exposed to a limited number of sound sources (*i.e.*, mostly tones and octave-band noise) in laboratory settings (Finneran, 2015). TTS was not observed in trained spotted (*Phoca largha*) and ringed (*Pusa hispida*) seals exposed to impulsive noise at levels matching previous predictions of TTS onset (Reichmuth *et al*., 2016). In general, harbor seals and harbor porpoises have a lower TTS onset than other measured pinniped or cetacean species (Finneran, 2015). The potential for TTS from impact pile driving exists. After exposure to playbacks of impact pile driving sounds (rate 2,760 strikes/hour) in captivity, mean TTS increased from 0 dB after 15 minute exposure to 5 dB after 360 minute exposure; recovery occurred within 60 minutes (Kastelein *et al*., 2016). Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. No data are available on noise-induced hearing loss for mysticetes. Nonetheless, what we considered is the best available science. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al*. (2007), Finneran and Jenkins (2012), Finneran (2015), and Table 5 in NMFS (2018).

Installing piles for these projects requires impact pile driving. There would likely be pauses in activities producing the sound during each day. Given these pauses and the fact that many marine mammals are likely moving through the project areas and not remaining for extended periods of time, the potential for TS declines.

Behavioral Harassment - Exposure to noise from pile driving and removal also has the potential to behaviorally disturb marine mammals. Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its

behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.*, Lusseau and Bejder, 2007; Weilgart, 2007; NRC, 2005).

Disturbance may result in changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); or avoidance of areas where sound sources are located. Pinnipeds may increase their haul-out time, possibly to avoid in-water disturbance (Thorson and Reyff, 2006). Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.*, species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.*, Richardson *et al.*, 1995; Wartzok *et al.*, 2004; Southall *et al.*, 2007; Weilgart, 2007; Archer *et al.*, 2010). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al.*, 2012), and can vary depending on characteristics associated with the sound source (*e.g.*, whether it is moving or stationary, number of sources, distance from the source). In general, pinnipeds seem more tolerant of, or at least habituate more quickly to, potentially disturbing underwater sound than do cetaceans, and generally seem to be less responsive to exposure to industrial sound than most cetaceans. Please see Appendices B and C of Southall *et al.* (2007) for a review of studies involving marine mammal behavioral responses to sound.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging

areas, the appearance of secondary indicators (*e.g.*, bubble nets or sediment plumes), or changes in dive behavior. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (*e.g.*, Croll *et al*., 2001; Nowacek *et al*., 2004; Madsen *et al*., 2006; Yazvenko *et al*., 2007). A determination of whether foraging disruptions incur fitness consequences would require information on or estimates of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal.

In 2016, the Alaska Department of Transportation and Public Facilities (ADOT&PF) documented observations of marine mammals during construction activities (*i.e.,* pile driving) at the Kodiak Ferry Dock (see 80 FR 60636, October 7, 2015). In the marine mammal monitoring report for that project (ABR 2016), 1,281 Steller sea lions were observed within the Level B disturbance zone during pile driving or drilling (*i.e.,* documented as Level B harassment take). Of these, 19 individuals demonstrated an alert behavior, 7 were fleeing, and 19 swam away from the project site. All other animals (98 percent) were engaged in activities such as milling, foraging, or fighting and did not change their behavior. In addition, two sea lions approached within 20 m of active vibratory pile driving activities. Three harbor seals were observed within the disturbance zone during pile driving activities; none of them displayed disturbance behaviors. Fifteen killer whales and three harbor porpoise were also observed within the Level B harassment zone during pile driving. The killer whales were travelling or milling while all harbor porpoises were travelling. No signs of disturbance were noted for either of these species. Given the similarities in species, activities, and habitat (*e.g.*, cool-temperate waters, industrialized area), we expect similar behavioral responses from the

same and similar species affected by the City's specified activities. That is, disturbance, if any, is likely to be temporary and localized (*e.g.,* small area movements).

Stress responses – An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.*, Seyle 1950; Moberg 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress – including immune competence, reproduction, metabolism, and behavior – are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.*, Moberg 1987; Blecha 2000). Increases in the circulation of glucocorticoids are also equated with stress (Romano *et al.*, 2004).

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and "distress" is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (*e.g.*, Holberton *et al.*, 1996; Hood *et al.*, 1998; Jessop *et al.*, 2003; Krausman *et al.*, 2004; Lankford *et al.*, 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker 2000; Romano *et al.*, 2002b) and, more rarely, studied in wild populations (*e.g.*, Romano *et al.*, 2002a). For example, Rolland *et al.* (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress." In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2003), however distress is an unlikely result of these projects based on observations of marine mammals during previous, similar projects in the area.

Masking - Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.*, those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al*., 1995). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g.*, snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.*, pile driving, shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.*, signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.*, sensitivity, frequency

range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions. Masking of natural sounds can result when human activities produce high levels of background sound at frequencies important to marine mammals. Conversely, if the background level of underwater sound is high (*e.g.*, on a day with strong wind and high waves), an anthropogenic sound source would not be detectable as far away as would be possible under quieter conditions and would itself be masked. The Seattle area contains active commercial shipping, ferry operations, and commercial fishing as well as numerous recreational and other commercial vessels, and background sound levels in the area are already elevated.

Airborne Acoustic Effects - Pinnipeds that occur near the project site could be exposed to airborne sounds associated with pile driving and removal that have the potential to cause behavioral harassment, depending on their distance from pile driving activities. Cetaceans are not expected to be exposed to airborne sounds that would result in harassment as defined under the MMPA.

Airborne noise would primarily be an issue for pinnipeds that are swimming or hauled out near the project site within the range of noise levels elevated above the acoustic criteria. We recognize that pinnipeds in the water could be exposed to airborne sound that may result in behavioral harassment when looking with their heads above water. Most likely, airborne sound would cause behavioral responses similar to those discussed above in relation to underwater sound. For instance, anthropogenic sound could cause hauled-out pinnipeds to exhibit changes in their normal behavior, such as reduction in vocalizations, or cause them to temporarily abandon the area and move further from the source. However, these animals would likely previously have been ‘taken’ because of exposure to underwater sound above the behavioral harassment thresholds, which are generally larger than those associated with airborne sound. There are no haulouts near the

project sites. Thus, the behavioral harassment of these animals is already accounted for in these estimates of potential take. Therefore, we do not believe that authorization of incidental take resulting from airborne sound for pinnipeds is warranted, and airborne sound is not discussed further here.

Marine Mammal Habitat Effects

The City's construction activities could have localized, temporary impacts on marine mammal habitat, including prey, by increasing in-water sound pressure levels and slightly decreasing water quality. Increased noise levels may affect acoustic habitat (see masking discussion above) and adversely affect marine mammal prey in the vicinity of the project areas (see discussion below). During impact and vibratory pile driving or removal, elevated levels of underwater noise would ensonify the project areas where both fishes and mammals occur and could affect foraging success. Additionally, marine mammals may avoid the area during construction, however, displacement due to noise is expected to be temporary and is not expected to result in long-term effects to the individuals or populations. Construction activities are of short duration and would likely have temporary impacts on marine mammal habitat through increases in underwater and airborne sound.

A temporary and localized increase in turbidity near the seafloor would occur in the immediate area surrounding the area where piles are installed or removed. In general, turbidity associated with pile installation is localized to about a 25-ft (7.6-m) radius around the pile (Everitt *et al.,* 1980). The sediments of the project site will settle out rapidly when disturbed. Cetaceans are not expected to be close enough to the pile driving areas to experience effects of turbidity, and any pinnipeds could avoid localized areas of turbidity. Local currents are anticipated to disburse any additional suspended sediments produced by project activities at moderate to rapid rates depending on tidal stage.

Therefore, we expect the impact from increased turbidity levels to be discountable to marine mammals and do not discuss it further.

In-water Construction Effects on Potential Foraging Habitat

The area likely impacted by the project is relatively small compared to the available habitat in Puget Sound. The area is highly influenced by anthropogenic activities. The total seafloor area affected by pile installation and removal is a small area compared to the vast foraging area available to marine mammals in the area. At best, the impact area provides marginal foraging habitat for marine mammals and fishes. Furthermore, pile driving and removal at the project site would not obstruct long-term movements or migration of marine mammals.

Avoidance by potential prey (*i.e.*, fish or, in the case of transient killer whales, other marine mammals) of the immediate area due to the temporary loss of this foraging habitat is also possible. The duration of fish and marine mammal avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution, and behavior is anticipated. Any behavioral avoidance by fish or marine mammals of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity.

In-water Construction Effects on Potential Prey - Sound may affect marine mammals through impacts on the abundance, behavior, or distribution of prey species (*e.g.*, crustaceans, cephalopods, fish, zooplankton, other marine mammals). Marine mammal prey varies by species, season, and location. Here, we describe studies regarding the effects of noise on known marine mammal prey other than other marine mammals (which have been discussed earlier).

Fish utilize the soundscape and components of sound in their environment to perform important functions such as foraging, predator avoidance, mating, and spawning (*e.g.*, Zelick and Mann, 1999; Fay, 2009). Depending on their hearing anatomy and

peripheral sensory structures, which vary among species, fishes hear sounds using pressure and particle motion sensitivity capabilities and detect the motion of surrounding water (Fay *et al.*, 2008). The potential effects of noise on fishes depends on the overlapping frequency range, distance from the sound source, water depth of exposure, and species-specific hearing sensitivity, anatomy, and physiology. Key impacts to fishes may include behavioral responses, hearing damage, barotrauma (pressure-related injuries), and mortality.

Fish react to sounds which are especially strong and/or intermittent low-frequency sounds, and behavioral responses such as flight or avoidance are the most likely effects. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. The reaction of fish to noise depends on the physiological state of the fish, past exposures, motivation (*e.g.*, feeding, spawning, migration), and other environmental factors. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fish; several are based on studies in support of large, multiyear bridge construction projects (*e.g.*, Scholik and Yan, 2001, 2002; Popper and Hastings, 2009). Several studies have demonstrated that impulse sounds might affect the distribution and behavior of some fishes, potentially impacting foraging opportunities or increasing energetic costs (*e.g.*, Fewtrell and McCauley, 2012; Pearson *et al.*, 1992; Skalski *et al.*, 1992; Santulli *et al.*, 1999; Paxton *et al.*, 2017). However, some studies have shown no or slight reaction to impulse sounds (*e.g.*, Pena *et al.*, 2013; Wardle *et al.*, 2001; Jorgenson and Gyselman, 2009; Popper *et al.*, 2015).

SPLs of sufficient strength have been known to cause injury to fish and fish mortality. However, in most fish species, hair cells in the ear continuously regenerate and loss of auditory function likely is restored when damaged cells are replaced with new cells. Halvorsen *et al.* (2012a) showed that a TTS of 4-6 dB was recoverable within 24

hours for one species. Impacts would be most severe when the individual fish is close to the source and when the duration of exposure is long. Injury caused by barotrauma can range from slight to severe and can cause death, and is most likely for fish with swim bladders. Barotrauma injuries have been documented during controlled exposure to impact pile driving (Halvorsen *et al.*, 2012b; Casper *et al.*, 2013).

The most likely impact to fishes from pile driving and removal and construction activities at the project areas would be temporary behavioral avoidance of the area. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution, and behavior is anticipated.

Construction activities, in the form of increased turbidity, have the potential to adversely affect forage fish in the project areas. Forage fish form a significant prey base for many marine mammal species that occur in the project areas. Increased turbidity is expected to occur in the immediate vicinity (on the order of 10 ft (3 m) or less) of construction activities. However, suspended sediments and particulates are expected to dissipate quickly within a single tidal cycle. Given the limited area affected and high tidal dilution rates any effects on forage fish are expected to be minor or negligible. Finally, exposure to turbid waters from construction activities is not expected to be different from the current exposure; fish and marine mammals in Elliott Bay are routinely exposed to substantial levels of suspended sediment from natural and anthropogenic sources.

In summary, given the short daily duration of sound associated with individual pile driving events and the relatively small areas being affected, pile driving activities associated with the proposed actions are not likely to have a permanent, adverse effect on any fish habitat, or populations of fish species. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. Thus, we conclude that impacts of the specified activities are not likely to have more than short-term adverse effects on any prey habitat

or populations of prey species. Further, any impacts to marine mammal habitat are not expected to result in significant or long-term consequences for individual marine mammals, or to contribute to adverse impacts on their populations.

Estimated Take

This section provides an estimate of the number of incidental takes proposed for authorization through these IHAs, which will inform both NMFS' consideration of "small numbers" and the negligible impact determinations.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as any act of pursuit, torment, or annoyance, which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Authorized takes would primarily be by Level B harassment (in the form of behavioral disturbance and TTS), as use of the acoustic sources (*i.e.*, vibratory or impact pile driving and removal) have the potential to result in disruption of behavioral patterns and cause a temporary loss in hearing sensitivity for individual marine mammals. There is also some potential for auditory injury (Level A harassment) to result for porpoises and harbor seals because predicted auditory injury zones are larger. The proposed mitigation and monitoring measures are expected to minimize the severity of the taking to the extent practicable.

As described previously, no serious injury or mortality is anticipated or proposed to be authorized for these activities. Below we describe how the take is estimated.

Generally speaking, we estimate take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be

behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and, (4) the number of days of activities. We note that while these basic factors can contribute to a basic calculation to provide an initial prediction of takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.,* previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the proposed take estimate.

Acoustic Thresholds

NMFS recommends the use of acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment for non-explosive sources – Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (*e.g.*, frequency, predictability, duty cycle), the environment (*e.g.*, bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall *et al.,* 2007; Ellison *et al.*, 2012). Based on what the available science indicates and the practical need to use a threshold based on a factor that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 microPascal (μPa) (root mean square (rms)) for continuous sources (*e.g.,* vibratory pile-driving, drilling) and above 160 dB re 1 μPa (rms) for non-

explosive impulsive (*e.g.*, seismic airguns) or intermittent (*e.g.*, scientific sonar) sources. This take estimation includes disruption of behavioral patterns resulting directly in response to noise exposure (*e.g.,* avoidance), as well as that resulting indirectly from associated impacts such as TTS or masking.

The City's proposed activities includes the use of continuous (vibratory hammer) and impulsive (impact hammer) sources, and therefore the 120 and 160 dB re 1 μPa (rms) thresholds are applicable.

Level A harassment for non-explosive sources - NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). The City's activities include the use of impulsive (impact hammer) and non-impulsive (vibratory hammer) sources.

These thresholds are provided in the table below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance*.

Table 5. Thresholds Identifying the Onset of Permanent Threshold Shift

	PTS Onset Acoustic Thresholds* (Received Level)	
Hearing Group	**Impulsive**	**Non-impulsive**
Low-Frequency (LF) Cetaceans	*Cell 1* $L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	*Cell 2* $L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	*Cell 3* $L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	*Cell 4* $L_{E,MF,24h}$: 198 dB

High-Frequency (HF) Cetaceans	*Cell 5* $L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	*Cell 6* $L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	*Cell 7* $L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	*Cell 8* $L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	*Cell 9* $L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	*Cell 10* $L_{E,OW,24h}$: 219 dB

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.

Note: Peak sound pressure (L_{pk}) has a reference value of 1 µPa, and cumulative sound exposure level (L_E) has a reference value of 1µPa^{2}s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (*i.e.*, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

Ensonified Area

Here, we describe operational and environmental parameters of the activities that will feed into identifying the area ensonified above the acoustic thresholds, which include source levels and transmission loss coefficient.

The sound field in the project areas is the existing background noise plus additional construction noise from the proposed project. Marine mammals are expected to be affected by sound generated by the primary components of the project (*i.e.*, impact and vibratory pile driving).

In order to calculate distances to the Level A harassment and Level B harassment thresholds for the methods and piles being used in this project, NMFS used acoustic monitoring data from other locations to develop source levels for the various pile types, sizes, and methods for the two piers (Tables 6 and 7).

Table 6. Pier 58 Project Sound Source Levels

Pile Type and Size (in)	Method	Source Level (dB re 1 µPa)	Reference

14-in timber, steel H-piles	Vibratory removal	152 dB rms	Greenbusch Group (2018)
24-in steel pipe pile	Vibratory removal and installation	163 dB rms	Greenbusch Group (2019)
30-in steel pipe pile	Vibratory installation	163 dB rms	Greenbusch Group (2019)
30-in steel pipe pile	Impact installation	180 dB rms[1], 193 dB peak	Greenbusch Group (2019)

[1] Highest RMS sound level from bubble curtain attenuated impact driving of 30-in steel piles at Pier 62

Table 7. Pier 63 Project Sound Source Levels

Pile Type and Size (in)	Method	Source Level (dB re 1 µPa)	Reference
14-in timber	Vibratory removal	152 dB rms	Greenbusch Group (2018)
30-in steel pipe pile	Vibratory removal	163 dB rms	Greenbusch Group (2019)

Level B Harassment Zones

Transmission loss (TL) is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The general formula for underwater TL is:

TL = B * Log10 (R1/R2), where

TL = transmission loss in dB

B = transmission loss coefficient; for practical spreading equals 15

R1 = the distance of the modeled SPL from the driven pile, and

R2 = the distance from the driven pile of the initial measurement

The recommended TL coefficient for most nearshore environments is the practical spreading value of 15. This value results in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions, which is the most appropriate assumption for the City's proposed activities in the absence of specific

modelling. The Level B harassment zones for the City's proposed activities are shown in Tables 8 and 9.

Level A Harassment Zones

The NMFS Technical Guidance (2018) recognizes that ensonified area/volume can be more technically challenging to predict because of the duration component in the new thresholds, and therefore includes a User Spreadsheet that includes tools to help predict a simple isopleth that can be used in conjunction with marine mammal density or occurrence to help predict takes. We note that because of some of the assumptions included in the methods used for these tools, we anticipate that isopleths produced are typically going to be overestimates of some degree, which may result in some degree of overestimate of Level A harassment. However, these tools offer the best way to predict appropriate isopleths when more sophisticated 3D modeling methods are not available, and NMFS continues to develop ways to quantitatively refine these tools, and will qualitatively address the output where appropriate. For stationary sources such as pile installation and removal, the NMFS User Spreadsheet predicts the distance at which, if a marine mammal remained at that distance for the whole duration of the activity, it would incur PTS. The isopleths generated by the User Spreadsheet used the same TL coefficient as the Level B harassment zone calculations (*i.e.*, the practical spreading value of 15). Inputs used in the User Spreadsheet (*e.g.*, number of piles per day, duration and/or strikes per pile) are presented in Tables 1 and 2, and the resulting isopleths are reported below in Tables 8 and 9. The areas expected to be ensonified above the Level B harassment threshold(s) are also presented in Tables 8 and 9. Due to the bathymetry and geography of the project areas, sound will not reach the full distance of the harassment isopleths in all directions.

Table 8. Pier 58 Level A Harassment and Level B Harassment Zones

Pile type	Level A harassment zone (m)					Level B harassment zone (m)	Level B ensonified area (km^2)
	LF cetacean	MF cetacean	HF cetacean	Phocids	Otariids		
Timber and steel H-pile removal	6.1	0.5	9.0	3.7	0.3	1,359[b]	2.35
24-in steel vibratory install and removal, 30-in steel vibratory install[a]	19.3	1.7	28.6	11.7	0.8	7,357[b]	34.34
30-in steel impact install	153.3	5.5	182.6	82.0	6.0	215[c]	0.07

[a] Level A harassment zones for vibratory installation and removal of steel piles calculated using the highest total duration of driving (installation of 30-inch piles) and conservatively applied to all vibratory pile driving.
[b] Distance to 120 dB rms threshold.
[c] Distance to 160 dB rms threshold.

Table 9. Pier 63 Level A Harassment and Level B Harassment Zones

Pile type	Level A harassment zone (m)					Level B harassment zone (m)[a]	Level B ensonified area (km^2)
	LF cetacean	MF cetacean	HF cetacean	Phocids	Otariids		
Timber	6.1	0.5	9.0	3.7	0.3	1,359	2.35
Steel	19.3	1.7	28.6	11.7	0.8	7,357	34.34

[a] Distance to 120 dB rms threshold.

Marine Mammal Occurrence and Take Calculation and Estimation

In this section we provide the information about the presence, density, or group dynamics of marine mammals that will inform the proposed take incidental to the City's pile driving activities. Unless otherwise specified, the term "pile driving" in this section, and all following sections, may refer to either pile installation or removal. The City considered estimating take using the ensonified area and density estimates from the U.S. Navy's Marine Species Density Database for the Northwest Training and Testing Study Area (U.S. Navy, 2019) but did not consider the resulting take estimates to be realistic (*i.e.*, either over- or underestimated take). Instead, the City compiled monitoring results from recent construction projects in Elliott Bay (*e.g.*, WSDOT, 2019; Anchor QEA,

2021) to estimate the likely daily or monthly occurrence of each species in the project areas. Unless otherwise specified, the occurrence information described below is used to estimate take for both the Pier 58 and Pier 63 projects. NMFS has carefully reviewed the City's analysis and concludes that it represents an appropriate and accurate method for estimating incidental take caused by the City's activities.

Humpback Whale

During previous work for the Pier 62 Project and the Elliott Bay Seawall Project, up to two humpback whales were observed during the approximately one month of work each year for both projects (Anchor QEA 2014, 2015, 2016, 2017, 2018 and 2019). Therefore, the City assumes that two humpback whales may be present in the project areas and taken by Level B harassment per month. The City anticipates up to 6 months of activities at Pier 58 and 3 months at Pier 63, for a total of 12 takes of humpback whales by Level B harassment from Pier 58 reconstruction and 6 takes by Level B harassment from Pier 63 removal.

Since the City would be required to comply with all mitigation and monitoring measures, including marine mammal monitoring and coordination with Orca Network (see **Proposed Mitigation**), these measures would likely be successful in detecting humpback whales given their size and visibility, the City would stop work before humpback whales could enter the small Level A harassment zones (up to 153.3 m), and humpback whales are infrequent visitors to the project areas, it is unlikely that any humpback whales would be taken by Level A harassment. No take of humpback whales by Level A harassment is requested or proposed to be authorized.

Gray Whale

Gray whales are infrequent visitors to the project areas but are most commonly seen during the winter months. Although no observations of gray whales have been reported during recent pile driving projects along the Seattle waterfront (*e.g.*, WSDOT

2021; Anchor QEA 2019), individual gray whales have been reported in Elliott Bay by WSDOT ferry operators in December 2018, January 2019, and November 2019. Therefore, the City estimates that one gray whale may be taken by Level B harassment in each winter month (November, December, January, and February) of the work window. Therefore, the City has requested 4 takes of gray whales by Level B harassment from Pier 58 reconstruction. Since Pier 63 removal is expected to take only 3 months total, the City has requested 3 takes of gray whales by Level B harassment from Pier 63 removal.

Since the City would be required to comply with all mitigation and monitoring measures, including marine mammal monitoring and coordination with Orca Network, these measures would likely be successful in detecting gray whales given their size and visibility, the City would stop work before gray whales could enter the small Level A harassment zones (up to 153.3 m), and gray whales are infrequent visitors to the project areas, it is unlikely that any gray whales would be taken by Level A harassment. No take of gray whales by Level A harassment is requested or proposed to be authorized.

Minke Whale

Minke whales are rarely observed in the project areas and none have been reported during monitoring for recent pile driving activities in the area (*e.g.*, WSDOT 2021; Anchor QEA 2019). The City estimates that no more than one minke whale per month may be taken by Level B harassment. Therefore, the City has requested 6 takes of minke whales by Level B harassment from Pier 58 reconstruction and 3 takes by Level B harassment from Pier 63 removal.

Like humpback and gray whales, minke whales are considered infrequent visitors to the project areas. As with humpback and gray whales, the City would be required to coordinate with Orca Network and would likely be alerted to the presence of minke whales in the area, allowing them to shut down pile driving equipment before a minke whale could enter the Level A harassment zones. Hence, in consideration of the expected

effectiveness of mitigation and infrequent occurrence, no take of minke whales by Level A harassment is requested or proposed to be authorized.

Transient Killer Whale

Transient killer whales are frequently seen in central Puget Sound and occasionally within Elliott Bay (Orca Network 2021). Transient killer whales typically travel in small groups. The City estimates that a group of 6 transient killer whales may enter the Level B harassment zone per month. Therefore, the City has requested take of 36 transient killer whales by Level B harassment from Pier 58 reconstruction and 18 takes by Level B harassment from Pier 63 removal.

The Level A harassment zones for mid-frequency cetaceans are all less than 10 m. The City would be required to coordinate with Orca Network and would likely be alerted to the presence of transient killer whales in the area, allowing them to detect the animals and cease pile driving well before killer whales could enter the Level A harassment zone. No take of transient killer whales by Level A harassment is requested or proposed to be authorized.

Southern Resident Killer Whale

Although SRKW are generally infrequently observed in Puget Sound, they are known to venture past the project areas during the fall and winter months as they hunt fall runs of salmon (Hanson *et al.*, 2021). Of the three pods within the SRKW population, J pod (which is comprised of 23 individuals; Orca Network, 2020) is the most likely to occur in the area.

The City would coordinate with the Orca Network to obtain sightings reports of SRKW near the project areas and shut down pile driving equipment before any SRKW enters the Level B harassment zone to avoid take of this stock. Given the relatively large size and visibility of SRKW, and the use of marine mammal sightings network reports (*i.e.*, Orca Network) for advanced notice of SRKW presence in Puget Sound, these

mitigation measures would likely be successful in preventing any Level B harassment. However, the City acknowledges that due to the large Level B harassment zone during vibratory installation and removal of steel piles at Pier 58 (approximately 7.4 km), over the course of 40 days of construction activities, it is possible that one pod of SRKW could enter the area undetected. That pod would most likely be J pod because it is the pod most likely to be near the project areas. In an abundance of caution, the City has requested take of 23 SRKW by Level B harassment from pile driving at Pier 58 in the event a pod were able to enter the Level B harassment zone prior to detection and shutdown.

During vibratory removal of timber piles at Pier 63, the Level B harassment zone is less than 1.4 km, which is well within Elliott Bay. SRKW are unlikely to enter the Level B harassment zone during this activity and even if they did, would be readily detected and pile removal activities shut down. The Level B harassment zone for vibratory removal of steel piles at Pier 63 is approximately 7.4 km, which reaches the outer extent of Elliott Bay and into the central core Puget Sound between Seattle and Bainbridge Island where SRKW may occur. However, removal of steel piles at Pier 63 is only expected to occur on 2 days, and given the mitigation measures that would be in place and the relatively large size and visibility of SRKW, the City considers it unlikely that SRKW would enter the Level B harassment zone undetected and be exposed to sound above the Level B harassment threshold before the City could cease pile driving activities. We concur with the City's conclusion.

The Level A harassment zones for all activities for both Pier 58 reconstruction and Pier 63 removal are less than 10 m for mid-frequency cetaceans. Given the size and visibility of killer whales, the City would be able to implement the proposed mitigation and monitoring measures and shut down pile driving equipment well before SRKW could

approach within 10 m. Therefore no take of SRKW by Level A harassment is expected to occur, and no Level A harassment is requested or proposed to be authorized.

Bottlenose Dolphin

In 2017 the Orca Network (2017) reported sightings of a bottlenose dolphin in Puget Sound and in Elliott Bay, and WSDOT observed two bottlenose dolphins in one week during monitoring for the Colman Dock Multimodal Project (WSDOT 2018). In addition, a group of 7 bottlenose dolphins were observed in 2017 and were positively identified as part of the California coastal stock (Cascadia Research Collective, 2017). Bottlenose dolphins typically travel in groups of 2 to 15 in coastal waters (Carretta *et al.*, 2020). The City estimates that 7 bottlenose dolphins may be taken by Level B harassment per month. Therefore, the City has requested take of 42 bottlenose dolphins by Level B harassment from Pier 58 reconstruction and 21 takes by Level B harassment from Pier 63 removal.

The Level A harassment zones for mid-frequency cetaceans are all less than 10 m. Given the visibility of bottlenose dolphins, the City would be able to cease pile driving before bottlenose dolphins could enter the Level A harassment zone. No take of bottlenose dolphins by Level A harassment is requested or proposed to be authorized.

Long-Beaked Common Dolphin

In June 2011, two long-beaked common dolphins were sighted in South Puget Sound. Sightings continued in 2012, and in 2016-17 (Carretta *et al.*, 2018). Sightings of 4 to 12 individuals were reported regularly, with confirmed sightings of up to 30 individuals. In 2016, the Orca Network (2016) reported a pod of up to 20 long-beaked common dolphins. During monitoring for the Colman Dock Project in 2017- 2018, 2 long-beaked common dolphins were observed in smaller Level B harassment zones than estimated for pile driving at Piers 58 and 63. The average reported group size of long-beaked common dolphins in Puget Sound is 7 individuals. Therefore, the City estimates 7

long-beaked common dolphins may be taken by Level B harassment per month and has requested take of 42 long-beaked common dolphins by Level B harassment from Pier 58 reconstruction and 21 takes by Level B harassment from Pier 63 removal.

The Level A harassment zones for mid-frequency cetaceans are all less than 10 m. Given the visibility of long-beaked common dolphins, the City would be able to cease pile driving before long-beaked common dolphins could enter the Level A harassment zone. No take of long-beaked common dolphins by Level A harassment is requested or proposed to be authorized.

Harbor Porpoise

Recent monitoring data from the Colman Dock Project (Pier 52) in 2017 and 2018 (WSDOT 2019) included observations of 288 harbor porpoises over 99 days of monitoring activity. This equates to approximately 3 porpoises per day.

To account for unobserved animals at the outer extent of the Level B harassment zones, the City estimates up to 6 harbor porpoises may enter the Level B harassment zone per day of pile driving at Pier 58 (70 days) for a total of 420 harbor porpoises. For impact installation of steel piles at Pier 58, the Level A harassment zone for high-frequency cetaceans is 183 m. Although the City would be required to implement a shutdown zone of 185 m during this activity (see **Proposed Mitigation**), due to the cryptic nature and lower detectability of harbor porpoises at large distances, the City anticipates that up to 12 of the harbor porpoises (2 per month) that enter the Level B zone could approach the project site closer and potentially enter the Level A harassment zone undetected during impact installation at Pier 58, which could occur as one group in one day or single animals over two days. The Level A harassment zones for all vibratory pile driving at Pier 58 are all under 30 m. At that distance, the City would be able to detect harbor porpoises and cease pile driving activities before harbor porpoises could enter the Level A harassment zone. Therefore, no take of harbor porpoises by Level A harassment is

anticipated from vibratory pile driving. In total, the City has requested take of 420 harbor porpoises, 408 takes by Level B harassment and 12 takes by Level A harassment from Pier 58 reconstruction.

On all but two days of work at Pier 63, the Level B harassment zone will be well within Elliott Bay. Since the extent of the Level B harassment zone for this project on most days is less than for Pier 58, the City estimates that up to 5 harbor porpoises may be taken by Level B harassment per day during 47 days of pile removal at Pier 63, for a total of 235 takes by Level B harassment. The largest Level A harassment zone from pile removal at Pier 63 is 29 m. At that close range, the City would be able to detect harbor porpoises and would be required to shut down pile driving activities before they approach within 29 m. Therefore, no take of harbor porpoises by Level A harassment from pile driving at Pier 63 is requested or proposed to be authorized.

Dall's Porpoise

Dall's porpoises are rarely sighted in the project areas. The City conservatively estimates that up to 12 Dall's porpoises may enter the Level B harassment zone per month, for a total of 72 Dall's porpoises from Pier 58 reconstruction and 36 from Pier 63 removal.

For impact installation of steel piles at Pier 58, the Level A harassment zone for high-frequency cetaceans is 183 m. Although the City would be required to comply with all mitigation and monitoring measures and would implement a shutdown zone of 185 m during this activity, the City anticipates that up to 12 of the Dall's porpoises (2 per month) that enter the Level B harassment zone could approach the project site closer and potentially enter the Level A harassment zone undetected during impact installation at Pier 58, which could occur as one group in one day or a single animal over two days. The Level A harassment zones for all vibratory pile driving at Pier 58 are all under 30 m. At that distance, the City would be able to detect Dall's porpoises and cease pile driving

activities before Dall's porpoises could enter the Level A harassment zone. Therefore, no take of Dall's porpoises by Level A harassment is anticipated from vibratory pile driving. In total, the City has requested take of 72 Dall's porpoise, 60 takes by Level B harassment and 12 takes by Level A harassment from Pier 58 reconstruction.

The largest Level A harassment zone from pile removal at Pier 63 is 29 m. At that close range, the City would be able to detect Dall's porpoises and would be required to shut down pile driving activities before they approach within 29 m. Therefore, no take of Dall's porpoises by Level A harassment from pile driving at Pier 63 is requested or proposed to be authorized. The City has requested 36 takes of Dall's porpoise by Level B harassment only for activities at Pier 63.

California Sea Lion

During monitoring for the Pier 62 Project, a maximum of 31 California sea lions were observed in one day, with an average of 6 takes per day (Anchor QEA 2019). To account for unobserved animals at the outer extent of the Level B harassment zones, the City estimates up to 10 California sea lions may be taken by Level B harassment per day for a total of 700 takes by Level B harassment from Pier 58 reconstruction and 470 takes by Level B harassment from Pier 63 removal.

The largest Level A harassment zone for otariid pinnipeds is 6 m. The City would be required to implement a minimum shutdown zone of 10 m for all activities. At that close range, the City would be able to detect California sea lions and implement the required shutdown measures before California sea lions could enter the Level A harassment zone. Therefore, no takes of California sea lions by Level A harassment are requested or proposed to be authorized.

Steller Sea Lion

Recent monitoring data from the Colman Dock Project in 2017 and 2018 (WSDOT 2019) reported observations of 54 Steller sea lions over 99 days of monitoring

activity, which is roughly equivalent to one Steller sea lion every other day. To account for unobserved animals at the outer extent of the Level B harassment zones, the City estimates two Steller sea lions may be taken by Level B harassment per day for a total of 140 takes by Level B harassment from Pier 58 reconstruction and 94 takes by Level B harassment from Pier 63 removal.

The largest Level A harassment zone for otariid pinnipeds is 6 m. The City would be required to enforce a minimum shutdown zone of 10 m for all activities. At that close range, the City would be able to detect Steller sea lions and implement the required shutdown measures before Steller sea lions could enter the Level A harassment zone. Therefore, no takes of Steller sea lions by Level A harassment are requested or proposed to be authorized.

Northern Elephant Seal

Individual elephant seals have occasionally been reported in central Puget Sound (*e.g.*, Orca Network, 2020) but are considered rare in the project areas. WSDOT (2019) reported observations near Alki Point (at the outer extent of the Level B harassment zones) and Maury Island (just outside the Level B harassment zones) in 2017 and 2015, respectively. Based on these reports, the City estimates that one northern elephant seal may be taken by Level B harassment per month for a total of 6 takes by Level B harassment from Pier 58 reconstruction and 3 takes by Level B harassment from Pier 63 removal.

The largest Level A harassment zone (82 m) occurs during impact installation of steel pipe piles at Pier 58. It is unlikely that northern elephant seals would be found within this zone, and even more unlikely that northern elephant seals would be found within the Level A harassment zones for vibratory pile driving at either pier (less than 12 m for all pile types). However, even if northern elephant seals were encountered in the project areas, at that close range, the City would be able to detect them and implement the

required shutdown measures before any northern elephant seals could enter the Level A harassment zones. Therefore, no take of northern elephant seals by Level A harassment is requested or proposed to be authorized.

Harbor Seal

During monitoring for the Pier 62 Project, the maximum number of harbor seals documented as taken by Level B harassment in one day was 54, but the average number documented per day was 5 (Anchor QEA 2019). To account for potentially unobserved animals at the outer extent of the Level B harassment zone during the previous monitoring, the City estimates that 10 harbor seals per day may enter the Level B harassment zone during pile driving work at Pier 58 for a total of 700 harbor seals. In addition, due to their apparent curious nature and previously reported close approaches to pile driving equipment (Anchor QEA 2019), the City estimates that of those 700 harbor seals that could enter the Level B harassment zone, one harbor seal may approach closer and enter the 82-m Level A harassment zone before the animal is detected and activities shut down, and thus be taken by Level A harassment on each day of impact pile installation at Pier 58 (40 days). The Level A harassment zones for phocids for all vibratory pile driving at Pier 58 are all under 12 m. At that distance, the City would be able to detect harbor seals and cease pile driving activities before harbor seals could enter the Level A harassment zone. Therefore, no take of harbor seals by Level A harassment is anticipated from vibratory pile driving at Pier 58. In total, the City has requested 700 takes of harbor seals, 660 takes by Level B harassment and 40 takes by Level A harassment from Pier 58 reconstruction.

On all but two days of work at Pier 63, the Level B harassment zone will be well within Elliott Bay. Since the extent of the Level B harassment zone for this project on most days is less than for Pier 58, the City estimates that up to 6 harbor seals may be

taken by Level B harassment per day during the 47 days of pile removal at Pier 63 for a total of 282 takes by Level B harassment.

The largest Level A harassment zone for the City's proposed activities at Pier 63 is 12 m. The City would be required to implement a 15 m shutdown zone to prevent Level A take of phocids for this project (see **Proposed Mitigation**). At that close range, the City would be able to detect harbor seals and cease pile driving activities before harbor seals could enter the Level A harassment zone. Therefore, no take of harbor seals by Level A harassment is requested or proposed to be authorized for work at Pier 63.

NMFS has carefully considered all information and analysis presented by the City as well as all other applicable information and, based on the best available science, concurs that the City's estimates of the types and amounts of take for each species and stock are complete and accurate.

Table 10. Proposed Take of Marine Mammals by Level A and Level B Harassment from Pier 58 Reconstruction, by Species and Stock and Percent of Take by Stock

Species	Stock	Proposed Take by Level B Harassment	Proposed Take by Level A Harassment	Stock Abundance	Percent of Stock
Humpback whale	California/Oregon/Washington	12[a]	0	4,973	0.24
Gray whale	Eastern North Pacific	4	0	26,960	0.01
Minke whale	California/Oregon/Washington	6	0	915	0.66
Killer whale	West Coast Transient	36	0	349	10.32
Killer whale	Southern Resident	23	0	72	31.94
Bottlenose dolphin	California Coastal	42	0	453	9.27
Long-beaked common dolphin	California	42	0	83,379	0.05
Harbor porpoise	Washington Inland Waters	408	12	11,233	3.74
Dall's porpoise	California/Oregon/Washington	60	12	16,498	0.44
California sea lion	U.S.	700	0	257,606	0.27
Steller sea lion	Eastern	140	0	43,201	0.32
Northern elephant seal	California Breeding	6	0	187,386	0.003

Harbor seal	Washington Northern Inland Waters	660	40	11,036	6.34

[a] Based on proportional estimates of humpback DPS occurrence in the area from Wade *et al.* (2021), we estimate that of the 12 total takes, 25 percent (approximately 3) would be from the threatened Mexico DPS and 6 percent (approximately 1) from the endangered Central America DPS. The remaining 69 percent of humpback whales (approximately 8) would be from the unlisted Hawai'i DPS.

Table 11. Proposed Take of Marine Mammals by Level A and Level B Harassment from Pier 63 Removal, by Species and Stock and Percent of Take by Stock

Species	Stock	Proposed Take by Level B Harassment	Proposed Take by Level A Harassment	Stock Abundance	Percent of Stock
Humpback whale	California/Oregon/Washington	6[a]	0	4,973	0.12
Gray whale	Eastern North Pacific	3	0	26,960	0.01
Minke whale	California/Oregon/Washington	3	0	915	0.33
Killer whale	West Coast Transient	18	0	349	5.16
Killer whale	Southern Resident	0	0	72	0
Bottlenose dolphin	California Coastal	21	0	453	4.64
Long-beaked common dolphin	California	21	0	83,379	0.02
Harbor porpoise	Washington Inland Waters	235	0	11,233	2.1
Dall's porpoise	California/Oregon/Washington	36	0	16,498	0.22
California sea lion	U.S.	470	0	257,606	0.18
Steller sea lion	Eastern	94	0	43,201	0.22
Northern elephant seal	California Breeding	3	0	187,386	0.002
Harbor seal	Washington Northern Inland Waters	282	0	11,036	2.56

[a] Based on proportional estimates of humpback DPS occurrence in the area from Wade *et al.* (2021), we estimate that of the 6 total takes, 25 percent (approximately 1) would be from the Mexico DPS and 6 percent (approximately 1) from the Central America DPS. The remaining 69 percent of humpback whales (approximately 4) would be from the unlisted Hawai'i DPS.

Proposed Mitigation

In order to issue an IHA under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses (latter not

applicable for these actions). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, we carefully consider two primary factors:

(1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned), the likelihood of effective implementation (probability implemented as planned), and;

(2) The practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

Time Restrictions

The City has provided in its description of the projects that pile driving would occur only during daylight hours, when visual monitoring of marine mammals can be conducted. In addition, all in-water construction would be limited to the period between September 1 and February 15.

Shutdown Zones

Before the commencement of in-water construction activities, the City would establish shutdown zones for all activities. The purpose of a shutdown zone is generally to define an area within which shutdown of the activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area). Pile driving would also not commence until all marine mammals are clear of their respective shutdown zones. Shutdown zones are meant to encompass the Level A harassment zones and therefore would vary based on the activity type and marine mammal hearing group (Tables 12 and 13). At minimum, the shutdown zone for all hearing groups and all activities is 10 m. For in-water heavy machinery work other than pile driving (*e.g.*, standard barges, *etc.*), if a marine mammal comes within 10 m, operations would cease and vessels would reduce speed to the minimum level required to maintain steerage and safe working conditions. This type of work could include, for example, the movement of the barge to the pile location or positioning of the pile on the substrate via a crane.

The City would also establish shutdown zones for all marine mammals for which take has not been authorized or for which incidental take has been authorized but the authorized number of takes has been met. These zones are equivalent to the Level B harassment zones for each activity (see Tables 12 and 13).

The City would also implement shutdown measures for SRKW. If SRKW are sighted within the vicinity of the project areas and are approaching the Level B harassment zone, the City would shut down the pile driving equipment to avoid possible take of the stock. If a killer whale approaches the Level B harassment zone during pile driving, and it is unknown whether it is a SRKW or a transient killer whale, it would be assumed to be a SRKW and the City would implement the shutdown measure. If a SRKW or an unidentified killer whale enters the Level B harassment zone undetected, in-water pile driving would be suspended until the whale exits the Level B harassment zone,

or 15 minutes have elapsed with no sighting of the animal, to avoid further Level B harassment.

Table 12. Shutdown Zones for Pier 58 Reconstruction

Pile type and method	Shutdown zone (m)					
	LF cetacean	MF cetacean	HF cetacean	Phocids	Otariids	SRKW (and other unauthorized species)
Timber and steel H-pile vibratory removal	10	10	10	10	10	1,359
24-in steel vibratory installation and removal, 30-in steel vibratory installation	20	10	30	15	10	7,357
30-in steel impact installation	155	10	185	85	10	215

Table 13. Shutdown Zones for Pier 63 Removal

Pile type	Shutdown zone (m)					
	LF cetacean	MF cetacean	HF cetacean	Phocids	Otariids	SRKW (and other unauthorized species)
Timber pile vibratory removal	10	10	10	10	10	1,359
Steel pile vibratory removal	20	10	30	15	10	7,357

Protected Species Observers

The placement of protected species observers (PSOs) during all pile driving activities (described in the **Proposed Monitoring and Reporting** section) would ensure that the entire shutdown zone is visible. Should environmental conditions deteriorate such

that the entire shutdown zone would not be visible (*e.g.*, fog, heavy rain), pile driving would be delayed until the PSO is confident marine mammals within the shutdown zone could be detected.

Monitoring for Level A and Level B Harassment

PSOs would monitor the Level B harassment zones to the extent practicable, and all of the Level A harassment zones. Monitoring zones provide utility for observing by establishing monitoring protocols for areas adjacent to the shutdown zones. Monitoring zones enable observers to be aware of and communicate the presence of marine mammals in the project areas outside the shutdown zones and thus prepare for a potential cessation of activity should the animal enter the shutdown zone.

Pre-Activity Monitoring

Prior to the start of daily in-water construction activity, or whenever a break in pile driving of 30 minutes or longer occurs, PSOs would observe the shutdown and monitoring zones for a period of 30 minutes. The shutdown zone would be considered cleared when a marine mammal has not been observed within the zone for that 30-minute period. If a marine mammal is observed within the shutdown zones listed in Tables 12 and 13, pile driving activity would be delayed or halted. If pile driving is delayed or halted due to the presence of a marine mammal, the activity would not commence or resume until either the animal has voluntarily exited and been visually confirmed beyond the shutdown zones or 15 minutes have passed without re-detection of the animal. When a marine mammal for which Level B harassment take is authorized is present in the Level B harassment zone, activities would begin and Level B harassment take would be recorded. If work ceases for more than 30 minutes, the pre-activity monitoring of the shutdown zones would commence. A determination that the shutdown zone is clear must be made during a period of good visibility (*i.e.*, the entire shutdown zone and surrounding waters must be visible to the naked eye).

Coordination with Local Marine Mammal Research Network

Prior to the start of pile driving for the day, and at the approximate mid-point of the pile driving work to be conducted each day, the PSOs would contact the Orca Network to find out the location of the nearest marine mammal sightings. The Local Marine Mammal Research Network consists of a list of over 600 (and growing) residents, scientists, and government agency personnel in the United States and Canada. Sightings are called or emailed into the Orca Network and immediately distributed to other sighting networks including: the NMFS Northwest Fisheries Science Center, the Center for Whale Research, Cascadia Research, the Whale Museum Hotline and the British Columbia Sightings Network.

Sightings information collected by the Orca Network includes detection by hydrophone. The SeaSound Remote Sensing Network is a system of interconnected hydrophones installed in the marine environment of Haro Strait (west side of San Juan Island) to study orca communication, in-water noise, bottom fish ecology and local climatic conditions. A hydrophone at the Port Townsend Marine Science Center measures average in-water sound levels and automatically detects unusual sounds. These passive acoustic devices allow researchers to hear when different marine mammals come into the region. This acoustic network, combined with the volunteer (incidental) visual sighting network allows researchers to document presence and location of various marine mammal species.

Soft Start

Soft-start procedures are used to provide additional protection to marine mammals by providing warning and/or giving marine mammals a chance to leave the area prior to the hammer operating at full capacity. For impact pile driving, contractors would be required to provide an initial set of three strikes from the hammer at reduced energy, followed by a 30-second waiting period, then two subsequent reduced-energy strike sets.

Soft start would be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of 30 minutes or longer.

Bubble Curtain

A bubble curtain would be employed during impact installation or proofing of steel piles. A noise attenuation device would not be required during vibratory pile driving. If a bubble curtain or similar measure is used, it would distribute air bubbles around 100 percent of the piling perimeter for the full depth of the water column. Any other attenuation measure would be required to provide 100 percent coverage in the water column for the full depth of the pile. The lowest bubble ring would be in contact with the mudline for the full circumference of the ring. The weights attached to the bottom ring would ensure 100 percent mudline contact. No parts of the ring or other objects would prevent full mudline contact.

Based on our evaluation of the City's proposed measures, as well as other measures considered by NMFS, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance for the Pier 58 Reconstruction Project. NMFS also preliminarily finds that the proposed mitigation measures and other measures considered by NMFS provide the means of effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance for the Pier 63 Removal Project.

Proposed Monitoring and Reporting

In order to issue an IHA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the

necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present while conducting the activities. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density).
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas).
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors.
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks.
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat).
- Mitigation and monitoring effectiveness.

Visual Monitoring

Marine mammal monitoring during pile driving activities would be conducted by PSOs meeting NMFS' standards and in a manner consistent with the following:

- Independent PSOs (*i.e.,* not construction personnel) who have no other assigned tasks during monitoring periods would be used;
- At least one PSO would have prior experience performing the duties of a PSO during construction activity pursuant to a NMFS-issued incidental take authorization;
- Other PSOs may substitute education (degree in biological science or related field) or training for experience; and
- Where a team of three or more PSOs is required, a lead observer or monitoring coordinator would be designated. The lead observer would be required to have prior experience working as a marine mammal observer during construction.

PSOs would have the following additional qualifications:

- Ability to conduct field observations and collect data according to assigned protocols;
- Experience or training in the field identification of marine mammals, including the identification of behaviors;
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;
- Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior; and
- Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

The City would have PSOs stationed around Elliott Bay to monitor during all pile driving activities. During removal of timber and/or steel H-piles at Pier 58 and Pier 63, two PSOs would monitor the area, one at the construction site and one at Alki Point on the south side of Elliott Bay. During vibratory removal and/or installation of steel piles at Pier 58 and Pier 63, PSOs would be stationed at the same locations as above, with an additional PSO monitoring from Magnolia on the north side of Elliott Bay and one PSO monitoring from the Seattle-Bainbridge ferry. Impact installation of 30-inch permanent steel piles at Pier 58 is expected to occur on the same day as vibratory installation of those piles. If all vibratory installation has concluded for the day, only the PSO stationed at the construction site would be required to continue monitoring during impact pile driving.

Monitoring would be conducted 30 minutes before, during, and 30 minutes after all in water construction activities. In addition, observers would record all incidents of marine mammal occurrence, regardless of distance from activity, and would document any behavioral reactions in concert with distance from piles being driven or removed. Pile driving activities include the time to install or remove a single pile or series of piles, as long as the time elapsed between uses of the pile driving equipment is no more than 30 minutes.

Reporting

A draft marine mammal monitoring report would be submitted to NMFS within 90 days after the completion of pile driving activities, or 60 days prior to a requested date of issuance of any future IHAs for the project, or other projects at the same location, whichever comes first. The marine mammal report would include an overall description of work completed, a narrative regarding marine mammal sightings, and associated PSO data sheets. Specifically, the report would include:

- Dates and times (begin and end) of all marine mammal monitoring;

- Construction activities occurring during each daily observation period, including: (a) How many and what type of piles were driven or removed and the method (*i.e.,* impact or vibratory); and (b) the total duration of time for each pile (vibratory driving) number of strikes for each pile (impact driving);
- PSO locations during marine mammal monitoring; and
- Environmental conditions during monitoring periods (at beginning and end of PSO shift and whenever conditions change significantly), including Beaufort sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon, and estimated observable distance.

For each observation of a marine mammal, the following would be reported:

- Name of PSO who sighted the animal(s) and PSO location and activity at time of sighting;
- Time of sighting;
- Identification of the animal(s) (*e.g.,* genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species;
- Distance and location of each observed marine mammal relative to the pile being driven or hole being drilled for each sighting;
- Estimated number of animals (min/max/best estimate);
- Estimated number of animals by cohort (adults, juveniles, neonates, group composition, etc.);
- Description of any marine mammal behavioral observations (*e.g.,* observed behaviors such as feeding or traveling), including an assessment of behavioral responses thought to have resulted from the activity (*e.g.,* no response or changes in behavioral state such as ceasing feeding, changing direction, flushing, or breaching);

- Number of marine mammals detected within the harassment zones, by species; and
- Detailed information about implementation of any mitigation (*e.g.,* shutdowns and delays), a description of specified actions that ensued, and resulting changes in behavior of the animal(s), if any.

If no comments are received from NMFS within 30 days, the draft reports would constitute the final reports. If comments are received, a final report addressing NMFS' comments would be required to be submitted within 30 days after receipt of comments. All PSO datasheets and/or raw sighting data would be submitted with the draft marine mammal report.

In the event that personnel involved in the construction activities discover an injured or dead marine mammal, the City would report the incident to the Office of Protected Resources (OPR) (PR.ITP.MonitoringReports@noaa.gov), NMFS and to the West Coast Region (WCR) regional stranding coordinator as soon as feasible. If the death or injury was clearly caused by the specified activity, the City would immediately cease the specified activities until NMFS is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the IHAs. The City would not resume their activities until notified by NMFS.

The report would include the following information:

1. Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
2. Species identification (if known) or description of the animal(s) involved;
3. Condition of the animal(s) (including carcass condition if the animal is dead);
4. Observed behaviors of the animal(s), if alive;
5. If available, photographs or video footage of the animal(s); and

6. General circumstances under which the animal was discovered.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through harassment, NMFS considers other factors, such as the likely nature of any responses (*e.g.*, intensity, duration), the context of any responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS's implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

Pile driving activities from Pier 58 reconstruction and Pier 63 removal have the potential to disturb or displace marine mammals. Specifically, the project activities may result in take, in the form of Level A and Level B harassment, from underwater sounds generated from pile driving. Potential takes could occur if individuals are present in the ensonified zone when these activities are underway.

The takes from Level A and Level B harassment would be due to potential behavioral disturbance, TTS, and PTS. No serious injury or mortality is anticipated given

the nature of the activities and measures designed to minimize the possibility of injury to marine mammals. The potential for harassment is minimized through the construction method and the implementation of the planned mitigation measures (see **Proposed Mitigation** section).

To avoid repetition, the majority of our analyses apply to all the species listed in Table 3, and to both the Pier 58 and Pier 63 IHAs, given that the anticipated effects of the City's two projects on different marine mammal stocks are expected to be relatively similar in nature. Where there are meaningful differences between species or stocks—as is the case of the SRKW—they are included as separate subsections below. Similarly, where there are differences between the two IHAs, they are highlighted below.

NMFS has identified key factors which may be employed to assess the level of analysis necessary to conclude whether potential impacts associated with a specified activity should be considered negligible. These include (but are not limited to) the type and magnitude of taking, the amount and importance of the available habitat for the species or stock that is affected, the duration of the anticipated effect to the species or stock, and the status of the species or stock. The following factors support negligible impact determinations for the affected stocks of humpback whales, gray whales, transient killer whales, bottlenose dolphins, long-beaked common dolphins, harbor porpoise, Dall's porpoise, California sea lions, Steller sea lions, northern elephant seals, and harbor seals. Some of these factors may also apply to SRKW; however, a more detailed analysis for SRKW is provided below.

No take by Level A harassment is anticipated or proposed to be authorized incidental to the Pier 63 Removal Project. For the Pier 58 Reconstruction Project, take by Level A harassment is proposed for three species (harbor seals, harbor porpoise, and Dall's porpoise) to account for the possibility that an animal could enter a Level A harassment zone prior to detection, and remain within that zone for a duration long

enough to incur PTS before being observed and the City shutting down pile driving activity. Any take by Level A harassment is expected to arise from, at most, a small degree of PTS, *i.e.*, minor degradation of hearing capabilities within regions of hearing that align most completely with the energy produced by impact pile driving (*i.e.* the low-frequency region below 2 kHz), not severe hearing impairment or impairment within the ranges of greatest hearing sensitivity. Animals would need to be exposed to higher levels and/or longer duration than are expected to occur here in order to incur any more than a small degree of PTS.

Additionally, the amount of authorized take, by Level A harassment is very low for all marine mammal stocks and species. For the Pier 58 Reconstruction Project, for 10 of 13 stocks, NMFS anticipates and proposes to authorize no Level A harassment take over the duration of the City's planned activities; for the other three stocks, NMFS authorizes no more than 40 takes by Level A harassment. If hearing impairment occurs, it is most likely that the affected animal would lose only a few decibels in its hearing sensitivity. These takes of individuals by Level A harassment (*i.e.,* a small degree of PTS) are not expected to accrue in a manner that would affect the reproductive success or survival of any individuals, much less result in adverse impacts on the species or stock.

As described above, NMFS expects that marine mammals would likely move away from an aversive stimulus, especially at levels that would be expected to result in PTS, given sufficient notice through use of soft start. The City would also shut down pile driving activities if marine mammals approach within hearing group-specific zones that encompass the Level A harassment zones (see Tables 12 and 13) further minimizing the likelihood and degree of PTS that would be incurred. Even absent mitigation, no serious injury or mortality from construction activities is anticipated or authorized.

Effects on individuals that are taken by Level B harassment in the form of behavioral disruption, on the basis of reports in the literature as well as monitoring from

other similar activities, would likely be limited to reactions such as avoidance, increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring) (*e.g.,* Thorson and Reyff 2006). Most likely, individuals would simply move away from the sound source and temporarily avoid the area where pile driving is occurring. If sound produced by project activities is sufficiently disturbing, animals are likely to simply avoid the area while the activities are occurring, particularly as the project is located on a busy waterfront with high amounts of vessel traffic. We expect that any avoidance of the project areas by marine mammals would be temporary in nature and that any marine mammals that avoid the project areas during construction would not be permanently displaced. Short-term avoidance of the project areas and energetic impacts of interrupted foraging or other important behaviors is unlikely to affect the reproduction or survival of individual marine mammals, and the effects of behavioral disturbance on individuals is not likely to accrue in a manner that would affect the rates of recruitment or survival of any affected stock.

Additionally, and as noted previously, some subset of the individuals that are behaviorally harassed could also simultaneously incur some small degree of TTS for a short duration of time. However, since the hearing sensitivity of individuals that incur TTS is expected to recover completely within minutes to hours, it is unlikely that the brief hearing impairment would affect the individual's long-term ability to forage and communicate with conspecifics, and would therefore not likely impact reproduction or survival of any individual marine mammal, let alone adversely affect rates of recruitment or survival of the species or stock.

The projects are also not expected to have significant adverse effects on affected marine mammals' habitats. The project activities will not modify existing marine mammal habitat for a significant amount of time. The activities may cause some fish to leave the area of disturbance, thus temporarily impacting marine mammals' foraging

opportunities in a limited portion of the foraging range; but, because of the short duration of the activities and the relatively small area of the habitat that may be affected (with no known particular importance to marine mammals), the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences. Aside from the SRKW critical habitat and BIA for gray whales described below, there are no known important areas for other marine mammals, such as feeding or pupping areas.

For all species and stocks, and both project areas (Pier 58 and 63), take would occur within a limited, relatively confined area (Elliott Bay within central Puget Sound) of the stock's range. Given the availability of suitable habitat nearby, any displacement of marine mammals from the project areas is not expected to affect marine mammals' fitness, survival, and reproduction due to the limited geographic area that would be affected in comparison to the much larger habitat for marine mammals in Puget Sound. Level A harassment and Level B harassment would be reduced to the level of least practicable adverse impact to the marine mammal species or stocks and their habitat through use of mitigation measures described herein. Some individual marine mammals in the project areas may be present and be subject to repeated exposure to sound from pile driving on multiple days. However, these individuals would likely return to normal behavior during gaps in pile driving activity. Therefore, any behavioral effects of repeated or long duration exposures are not expected to negatively affect survival or reproductive success of any individuals. Thus, even repeated Level B harassment of some small subset of an overall stock is unlikely to result in any effects on rates of reproduction and survival of the stock.

Southern Resident Killer Whales

No takes of any sort are proposed to be authorized or anticipated for SRKW at the Pier 63 project. For the Pier 58 project, no permanent hearing impairment (PTS), or any other Level A harassment, is anticipated or proposed to be authorized; authorized takes of

SRKW at Pier 58 would be limited to Level B harassment in the form of behavioral disturbance.

SRKW may be exposed to sound above the Level B harassment threshold during the Pier 58 reconstruction project. Although the City would be required to shut down any pile driving equipment before SRKW approach the Level B harassment zone, there is some potential that one or more SRKW could enter the area undetected and be taken before the City is able to shut down. If that were to occur, it is likely that the whales would be detected at the outer edges of the Level B harassment zone, which would lessen the degree of sound than would be experienced if they were to approach closer to the project site. Therefore, if SRKW were exposed to sound above the Level B harassment threshold, it would generally be of a lower level and very short duration (only the time to detect the animals and shut down), which is expected to lessen the degree and duration of potential disturbance.

SRKW could be foraging while traveling past the Pier 58 reconstruction area and cease foraging effort in response to sound from the project if they entered the Level B harassment zone undetected, as discussed above. Most studies on the effects of disturbance on SRKW foraging have focused on impacts of whale watch vessels operating in close proximity to SRKW, and commercial shipping traffic in the Salish Sea. Exposure to vessel noise and presence of whale watching boats can significantly affect the foraging behavior of SRKW (Williams *et al.,* 2006; Lusseau *et al.,* 2009; Giles and Cendak 2010; Senigaglia *et al.,* 2016). Nutritional stress has also been identified as a primary cause of SRKW decline (Ayres *et al.,* 2012; Wasser *et al.,* 2017), suggesting that reduced foraging effort may have a greater impact than behavioral disturbance alone. However, given the typical frequency of killer whale foraging echolocation clicks (18 to 32 kHz), Lacy *et al.* (2017) note that high-frequency noise from small, outboard motors on many commercial whale watching and private vessels likely causes a greater reduction

in killer whale foraging success than low-frequency (< 1 kHz) noise from commercial shipping or pile driving (< 2 kHz). While SRKW may experience elevated sound levels of lower frequencies from the City's proposed projects if they were to enter the Level B harassment zone during pile driving activities, the relatively small amount of time of altered behavior and minimal overlap of the predominant frequencies of pile driving and echolocation would not likely affect their overall foraging ability. Short-term impacts to foraging ability are not likely to have any effect on reproduction or survival of the individual SRKW, let alone effects on rates of recruitment or survival for the population as a whole (*see* Ayres *et al.,* 2012). Given the extensive monitoring and mitigation measures for all marine mammals and SRKW in particular, it is unlikely that individual whales would be exposed on multiple occasions.

ESA critical habitat for SRKW has been designated in Puget Sound, including the project areas (71 FR 69054; November 29, 2006). Critical habitat features were identified in consideration of physical and biological features essential to conservation of SRKW (essential features): (1) Water quality to support growth and development; (2) Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth; and (3) Passage conditions to allow for migration, resting, and foraging. NMFS did not identify in-water sound levels as a separate essential feature of critical habitat, though anthropogenic sound is recognized as one of the primary threats to SRKW (NMFS 2019). The exposure of SRKW to sound from the proposed activities would be minimized by the required proposed mitigation measures (*e.g.*, shutdown zones equivalent to the Level B harassment zones). The effects of the activities on SRKW habitat generally, such as sedimentation and impacts to availability of prey species, are expected to be limited both spatially and temporally, constrained to the immediate area around the pile driver(s) at each pier and returning to baseline levels quickly. Additionally, the timing of the in-water

work window for the projects is intended to limit impacts to juvenile salmonids, which would accordingly reduce potential impacts to SRKW prey. We therefore conclude that the proposed activities would have a negligible impact on SRKW.

Gray Whales

Puget Sound is part of a BIA for migrating gray whales (Calambokidis *et al*., 2015). While Elliott Bay is included in the BIA, gray whales typically remain further north in Puget Sound, primarily in the waters around Whidbey Island (Calambokidis *et al.*, 2018). Gray whales are rarely observed in Elliott Bay. Therefore, even though the project areas overlap with the BIA, the infrequent occurrence of gray whales suggests that the proposed projects would have minimal, if any, impact on the migration of gray whales in the BIA, and would therefore not affect reproduction or survival.

There is an ongoing UME for gray whales (see the **Description of Marine Mammals in the Area of Specified Activities** section of this notice). However, we do not expect the takes estimated to occur and proposed for authorization to exacerbate or compound upon these ongoing UMEs. As noted previously, no Level A harassment, serious injury, or mortality is expected or proposed for authorization, and any Level B harassment takes of gray whales would most likely be in the form of behavioral disturbance. The project areas have not been identified as important for feeding or mating gray whales, and therefore the projects are unlikely to disrupt any critical behaviors or have any effect on the reproduction or survival of gray whales, even in light of the ongoing UME.

In summary and as described above, the following factors primarily support our preliminary determination that the impacts resulting from these activities are not expected to adversely affect any of the species or stocks through effects on annual rates of recruitment or survival:

- No mortality or serious injury is anticipated or proposed to be authorized for either project;
- No take of any species by Level A harassment is anticipated or proposed to be authorized for the Pier 63 Removal Project;
- For the Pier 58 Reconstruction Project, Level A harassment is not anticipated or proposed to be authorized for 10 of the 13 species. For the other three species, the amount of Level A harassment is low and would be in the form of a slight degree of PTS;
- For both projects, Level B harassment would be in the form of behavioral disturbance, primarily resulting in avoidance of the project areas around where impact or vibratory pile driving is occurring, and some low-level TTS that may limit the detection of acoustic cues for relatively brief amounts of time in relatively confined footprint of the activities;
- Nearby areas of similar habitat value within Puget Sound are available for marine mammals that may temporarily vacate the project areas during construction activities for both projects;
- Effects on species that serve as prey for marine mammals from the activities are expected to be short-term and, therefore, any associated impacts on marine mammal feeding are not expected to result in significant or long-term consequences for individuals, or to accrue to adverse impacts on their populations from either project;
- The number of anticipated takes by Level B harassment is relatively low for all stocks for both projects;
- The ensonifed areas from both projects are very small relative to the overall habitat ranges of all species and stocks, and will not adversely affect ESA-designated critical habitat, or cause more than minor impacts in any BIAS or any other areas of known biological importance;

- The lack of anticipated significant or long-term negative effects to marine mammal habitat from either project;
- The efficacy of the mitigation measures in reducing the effects of the specified activities on all species and stocks for both projects;
- The enhanced mitigation measures (*e.g.*, shutdown zones equivalent to the Level B harassment zones) to eliminate (for the Pier 63 Removal Project) and reduce (for the Pier 58 Reconstruction Project) the potential for any take of SRKW; and
- Monitoring reports from similar work in Puget Sound that have documented little to no effect on individuals of the same species that could be impacted by the specified activities from both projects.

Based on the analysis contained herein of the likely effects of the specified activities on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from the Pier 58 Reconstruction Project will have a negligible impact on all affected marine mammal species or stocks. NMFS also preliminarily finds that the total marine mammal take from the Pier 63 Removal project will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. When the predicted number of individuals to be taken is fewer than one third

of the species or stock abundance, the take is considered to be of small numbers. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

The estimated take proposed to be authorized for each project is below one third of the population for all marine mammal stocks (Table 10 and 11).

Based on the analysis contained herein of the proposed activities (including the proposed mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS preliminarily finds that small numbers of marine mammals would be taken relative to the population size of the affected species or stocks for the Pier 58 Reconstruction Project. NMFS also preliminarily finds that small numbers of marine mammals would be taken relative to the population size of the affected species or stocks for the Pier 63 Removal Project.

Unmitigable Adverse Impact Analysis and Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by either of these projects. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

Endangered Species Act

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq*.) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of IHAs, NMFS consults internally whenever we propose to authorize take for endangered or threatened species, in this case with the West Coast Region Resources Division Office.

NMFS is proposing to authorize take of Southern Resident killer whales and Central America and Mexico DPSs of humpback whales, which are listed under the ESA.

The Permit and Conservation Division has requested initiation of Section 7 consultation with the West Coast Region for the issuance of these IHAs. NMFS will conclude the ESA consultation prior to reaching a determination regarding the proposed issuance of the authorizations.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue two IHAs to the City, one each for their Pier 58 Reconstruction Project and their Pier 63 Removal Project on the Seattle Waterfront in Seattle, Washington, effective as of August 2022, provided the previously discussed mitigation, monitoring, and reporting requirements are incorporated. The proposed IHAs can be found at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act*.

Request for Public Comments

We request comment on our analyses, the proposed authorizations, and any other aspect of this notice of proposed IHAs for the proposed Pier 58 Reconstruction and Pier 63 Removal Projects. We also request at this time comment on the potential Renewal of these proposed IHAs as described in the paragraph below. Please include with your comments any supporting data or literature citations to help inform decisions on the request for these IHAs or subsequent Renewal IHAs.

On a case-by-case basis, NMFS may issue a one-time, one-year Renewal IHA following notice to the public providing an additional 15 days for public comments when (1) up to another year of identical or nearly identical activities as described in the **Description of Proposed Activities** section of this notice is planned or (2) the activities as described in the **Description of Proposed Activities** section of this notice would not

be completed by the time the IHA expires and a Renewal would allow for completion of the activities beyond that described in the *Dates and Duration* section of this notice, provided all of the following conditions are met:

(1) A request for renewal is received no later than 60 days prior to the needed Renewal IHA effective date (recognizing that the Renewal IHA expiration date cannot extend beyond one year from expiration of the initial IHA);

(2) The request for renewal must include the following:

- An explanation that the activities to be conducted under the requested Renewal IHA are identical to the activities analyzed under the initial IHA, are a subset of the activities, or include changes so minor (*e.g.*, reduction in pile size) that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take); and
- A preliminary monitoring report showing the results of the required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized.

(3) Upon review of the request for Renewal, the status of the affected species or stocks, and any other pertinent information, NMFS determines that there are no more than minor changes in the activities, the mitigation and monitoring measures will remain the same and appropriate, and the findings in the initial IHA remain valid.

Dated: February 28, 2022.

Kimberly Damon-Randall,

Director, Office of Protected Resources,

National Marine Fisheries Service.

[FR Doc. 2022-04499 Filed: 3/2/2022 8:45 am; Publication Date: 3/3/2022]